WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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VOL. III.—No. 148.] SATURDAY, JANUARY 16, 1892. [PRICE ONE PENNY.

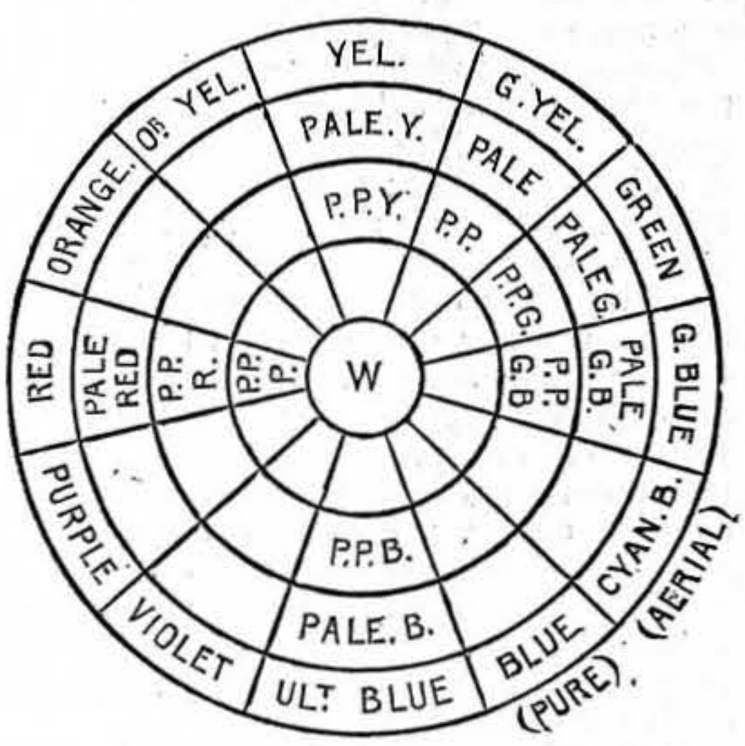

Fig. 1.—Contrasting Colours opposed in Sectors, with Corresponding Tints by addition of White. After O. N. Rood.

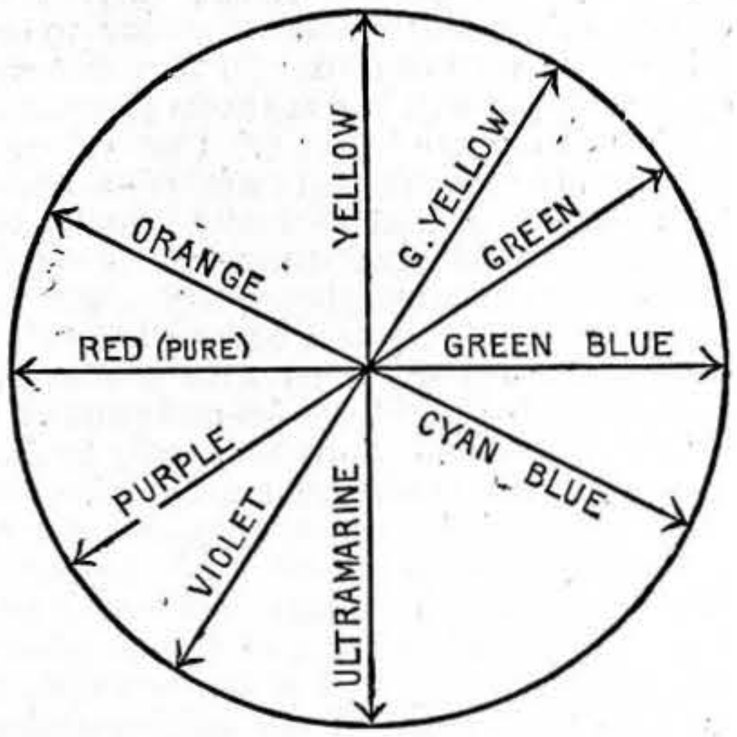

Fig. 2.—Pure Spectral Colours arranged in a Circle to show Exact Complementaries. After O. N. Rood.

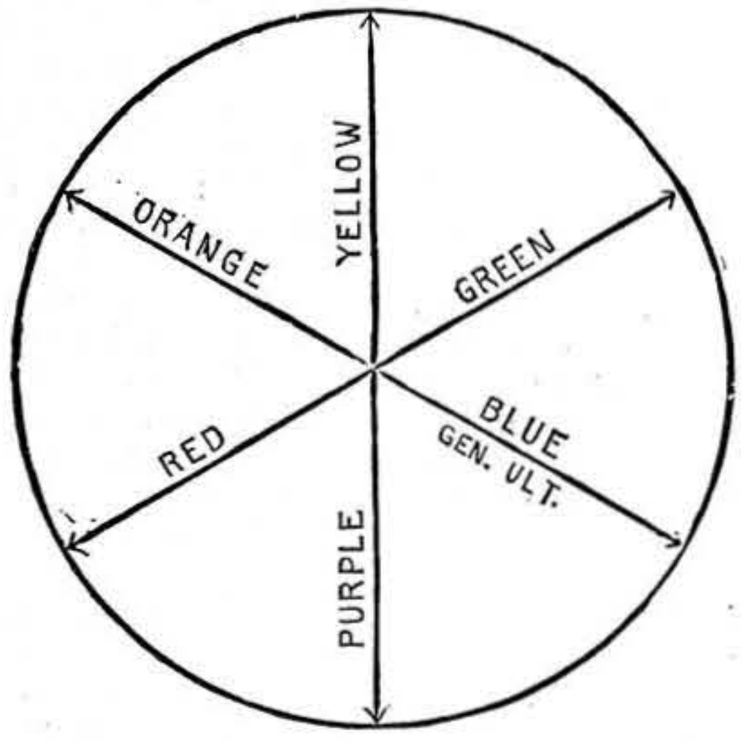

Fig. 3.—Complementary Colours of the Old Theory. After G. Field.

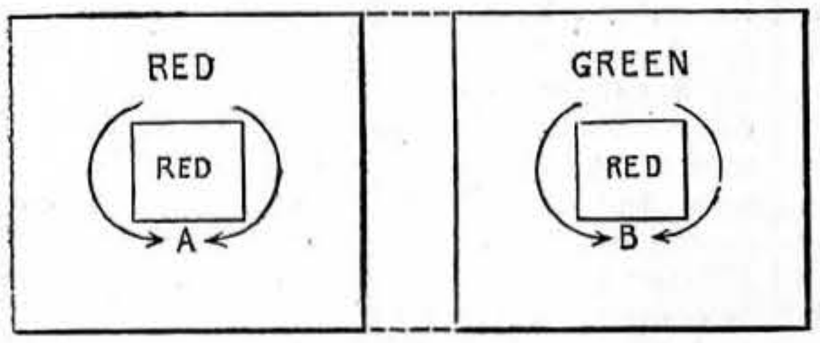

Fig. 4.—Pieces of Red and Green Paper with Red Squares placed thereon. Result—B appears brighter than A.

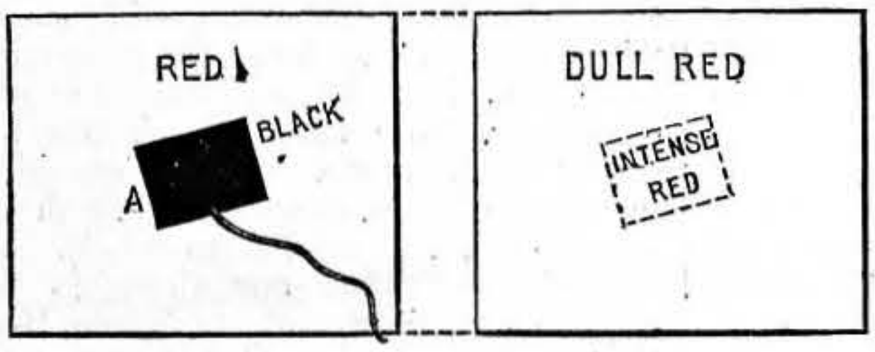

Fig. 5.—Red Paper with Black Disc. Gaze intently, draw A away, leaving Image of Brighter Red.

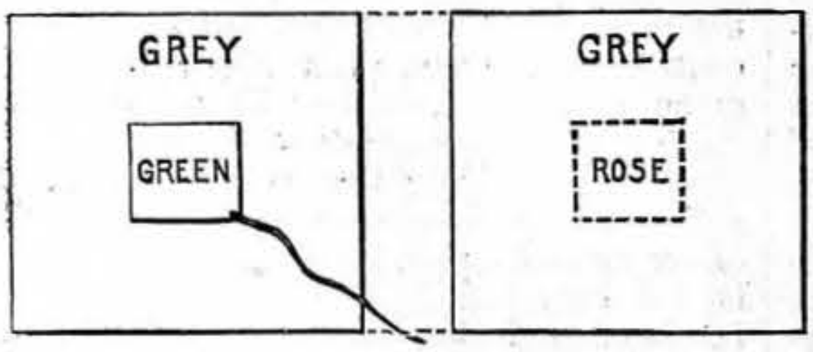

Fig. 6.—Grey Paper with Green Slip. Gaze intently, then remove, leaving Rose-tinted Image.

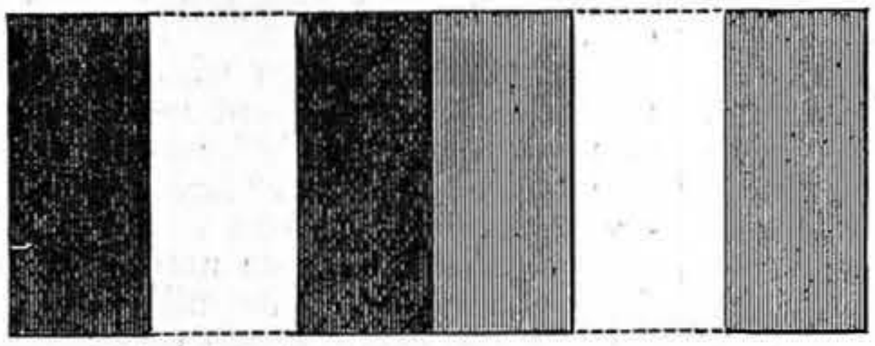

Fig. 7.—Forced Contrast of Shade. Two Tints of One Colour placed thus, the difference appears greater.

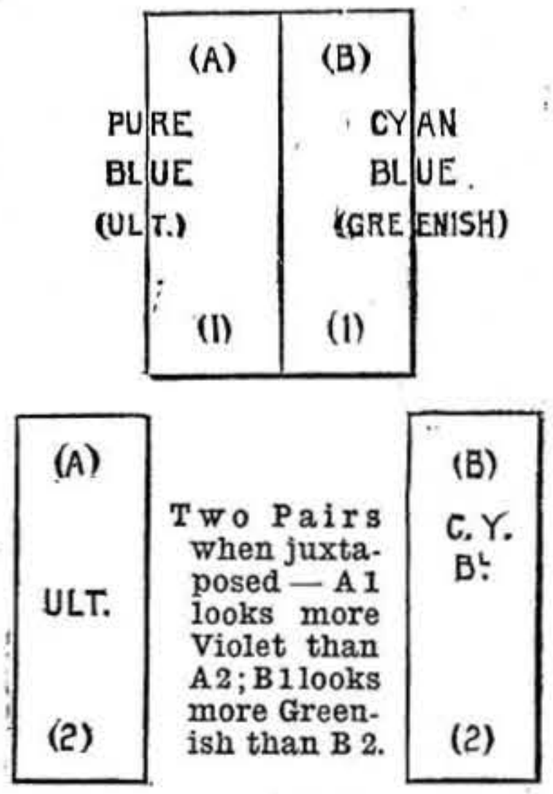

Fig. 8.—Forced Contrast of Hue or Colour Contrast.

*** Figs. 1, 2, 3, showing Complementaries, and Figs. 4—8 for Experiments with Contrast Effects, should be reproduced with properly Coloured Surfaces three or four times larger.

COLOUR IN OUR HOMES.

BY FREDERICK PARSONS, F.S.Sc.

COLOUR—ITS PRACTICABILITY—ÆSTHETIC PROVINCE AND VALUE—SENTIMENT AND ITS EXPRESSION IN COLOUR — FOR DINING AND DRAWING ROOMS — HALL AND STAIRCASE — STUDY AND SLEEPING ROOMS—COLOUR CONTRASTS AND CONCLUSIONS.

"OF all God's gifts to the sight of man, colour is the holiest, the most divine, the most solemn."

Although a considerable period of time has elapsed since Ruskin sent forth into the world this remarkable sentence, its truth and importance are still almost unknown and unappreciated by the mass of workers. Notwithstanding the reproach that same prophet levelled against us, that as a nation we are insensible to the value of colour, has been of recent years to some extent removed, to the great majority of to-day my opening lines read more like the far-fetched outpourings of an eccentric art critic than as the simple statement of a beautiful fact. That which the art of music is through the sense of hearing—a source of pure enjoyment and elevation of the mind—so a bountiful Creator intended colour to fulfil a like mission through the medium of our vision. Were it not so, for what other reason could the fields be clothed with soothing hues of green, the ripened corn reflecting back, as it were, the glory of the golden orb of day? Why do not the ethereal vaults of illimitable space ever appear a dreary expanse of wintry grey? These and a thousand other like questions have one common answer. Their colour is to cheer and brighten the soul of man. The necessities of our present purpose, however, require that we forsake metaphysical consideration of colour for its more definite and ministering visual aspects. In this latter course we are at once confronted by various difficulties. Teaching colour without being able to appeal to the mind by the aid of samples is akin to attempting to learn a musical instrument upon a dummy keyboard. Worse, indeed, since Do. is the same on all pianos, whilst *my* "aërial blue," "old gold," or "terra cotta" may be considerably different, my reader, from *your* interpretation of these indefinite colour terms. Beyond this fact, successful application of colour demands a foundation of some practical and theoretical knowledge, and here we have but little space for considering either. Incompleteness must, therefore, characterise my paper; nevertheless, if it be the humble

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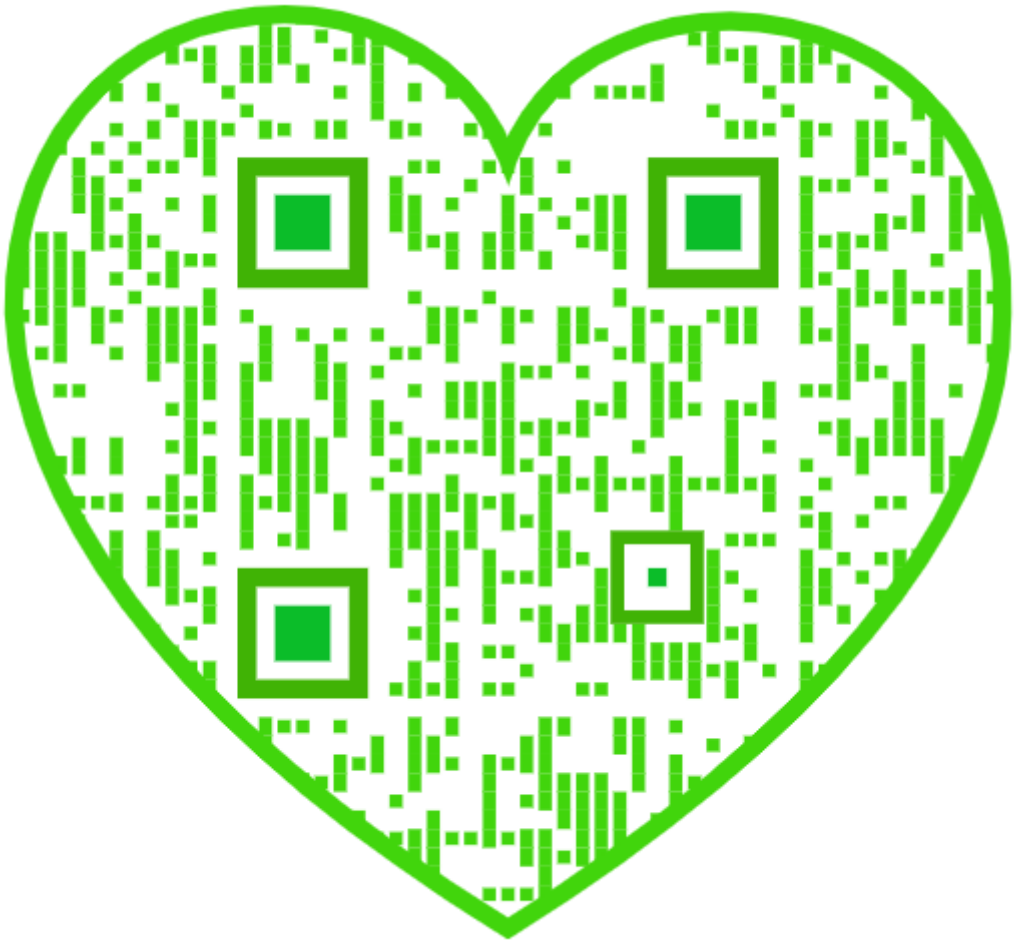

means of arousing the interest of some readers to the dormant claims and pleasures of "colour in the home," to those, at least, this effort will not be unsuccessful.

The practical utility of colour is a consideration well worthy a few lines herein. An eminent scientific man and author of valuable works on colour, the late George Field, in answer to a query on the subject, says that colour is of *no use!* This is too sweeping an assertion for us to pass by unnoticed, for although, as he truly writes, the colours of flowers are not known to serve any real purpose, we must discriminate a little when dealing with nature's colour painting and colours applied by man. It would be worse than useless, however, to endeavour to argue this point by the aid of suppositionary deductions from a world without colour. The bare suggestion of a gloomy earth of monotone ranging but from ghastly white to a blackness "that may be felt," is depressive enough for all of us. The colours of ordinary oak-grained or marbled surfaces, the ever-durable range of "stone," "buff," "drab," and brown tones are, however, familiar to us owing to their *usefulness* more than to any considerations of beauty; whilst many of us would strongly object to an exclusive usurpation by the world's creative or purely material objects and forces of the term "useful." In its application to moulded form, as shown in a preceding paper, colour has very definite properties, and especially in the Gothic and Mauresque styles of architecture and decoration it is a form-creative power, giving results entirely beyond the effects of light and shade, or monotone.

It is for its *æsthetic value*, however, that colour must be chiefly studied and employed. As a medium for conveying the poetic sentiments of one mind to the understanding of others; as a pleasure-giving factor in this world of commercialism. This is the cause we are trying to plead. Every year finds musical powers and culture, the source of tonal harmonies, more general to all homes. The province of colour is equally as definite as music, and perhaps more widespread, for Nature gives us all lessons in colour, and evidently meant us to have pleasure therefrom.

Sentiment is without doubt the inward and intellectual force of outward, visible colour signs. The faculty of expressing poetic thought by the medium of colour and form does not come naturally to us all, any more than do the powers of poet and musician. Neither, from the same reason, are we alike all able to appreciate and interpret elaborately poetic or, as it is commonly termed, *harmonious* colour. Modern civilisation and scholastic training teach us to dislike harsh discords of sound and colour, but will not enable us, intuitively, to produce harmonious combinations. Even as a limited power of discrimination is common to all of us, so it must further be recognised that natural faculties or "gifts" of expressive power in either music, language, colour and form are but the happy privilege of a limited few. Study and perseverance can work wonders towards the acquiring of these powers, but it is seldom that the highest degree of excellence is reached without the co-operation of the natural, pre-existing faculties. Thus having unburdened one's mind so far as appeared necessary respecting colour "in the abstract," we may now consider it as a power of visual expression.

Expressions of colour is a term here used solely with respect to colour language conveyed to the brain through the medium of our vision. The sun's rays—the first cause of all colour—may be considered and analysed both from visual and chemical standpoints, the latter being only intimately concerned, for instance, with photographic and kindred processes. We will content ourselves by now broadly stating a few accepted scientific facts. (1) That white light is composed of all colours; (2) that all colour sensation or vision is caused by the stimulation of the optic nerve; (3) that light reaches the vision in infinitely small wave formations; (4) that the different colour sensations are owing to the various differences in length of these undulating waves; (5) that, with perfect vision, there exist certain colour nerves corresponding to certain colour wave-lengths; (6) that different coloured lights will in some cases produce by their union white light; (7) that coloured lights, and hence coloured surfaces—coloured light necessarily and naturally forming the basis of practical colour study—which so combine are known as complementary colours; (8) that complementary and contrasting colour combinations provide us with a scientific foundation for the principles and practice of *colour harmony*—foundation only! The successful superstructure must be the outcome of knowledge, experience, and faculty.

Having thus briefly set forth the source of colour sensations and the theoretical basis of colour harmony, so far as present considerations required of us, we will again take up the thread of our subject—colour expressions.

The "language of colour," if we may so term it, finds its elements in Nature; whilst the particular sentiments usually associated with particular colours in the ancient science and art of heraldry, and also in symbolism of colour, fully accord with our natural colour impressions. Let us consider the principal colours, commencing with *Yellow*, the nearest in position to white. Yellow immediately turns our thoughts to the source of all light, and—to quote Baron F. Portal—"the heat and brightness of the sun designate the love of God which animates the heart and the wisdom which enlightens the intellect." Heraldic distinctions further associate with it "gold," the richest and most brilliant metal; the glory of midsummer "July" and "noontide;" also "blitheness" and "force"—all of which are characterised by one vein of sentiment.

With *Red* colour we naturally associate fire and heat, or, in its milder sentiments, warmth and comfort. In ecclesiastical decoration red signifies the consuming, never-failing fire of Divine love; whilst heraldry classes with it the age of "manhood," the activity of "passion," and the virtue of "charity"—*i.e.*, love. *Blue* finds its corresponding sentiment in the expanse of the heavens speaking of illimitable space; the truths of immortality; the faith as of childhood; and in heraldry of justice, of the summer season and the element of air. The common association of blue with the cool sensation of water is owing to the sky colour being reflected in the latter; to the blue appearance of snow-clad mountain tops; and, particularly, by reason of blue being a strong and direct colour contrast to yellow and red, viz., light and heat, it follows that coolness and distance are the particular expression of all blue combinations. With *Green* we associate the cheering vegetation of spring-time. Pure green is much more scarce in Nature than we imagine. The coolness and soothing characteristics of Nature's varied green tones is due to a large admixture of cool, grey atmospheric hues. Green in heraldry is classed with "youth" and strength, but as in temper it is designated by the term *bilious*, we still get a suggestive rendering of its dangerous expression when used in a *pure* state. If for the moment we here accept the three colours, red, blue, and yellow, as being primary or source colours, and which by admixture produce every other colour, such being true *respecting pigments*, but totally *wrong in relation to colour* waves, or coloured light, it follows that their colour expression may be equally varied and combined. In addition to the foregoing, however, we must analyse the two extremes, or neutrals rather, of white and black. The sentiment of *white* is pre-eminently "purity," of the "unstained." It is associated with the "morning" of day, the "infancy" of existence; of the "beginning." In heraldry, again, its associates are the element, water; the whiteness of silver, and its floral type is the "lily." Lastly with *black*, as we all know and feel, the mind is stirred to the depressions of winter and night. Old age and decay in their natural order answer not to the colour sensations of childhood, youth, or manhood. The things of this perishable, material earth lose themselves in physical decay, and so. as with colour, the end of the course is neutrality. One point in its connection with the ancient heraldic art we must not overlook, namely, that black in connection with the virtues is consistently interpreted as "prudence."

Now for the practical value and service of the foregoing—its connection with "colour in our homes." In the first place, let us note that as white light contains all and mixes with all colour, so white bodies have the same province in using material colour, both being necessary in great proportion to the service of colour. Taking now the *drawing room* of present civilisation, what should be its colour expression? White ought to predominate either in mass or in combination as tints with other colours—and these colours? First yellow, then its contrast blue. Yellow to add richness and brilliancy, blue to relieve and enhance it—just as the "field" of blue sky in contrast to the sun. But why not pink or green sentiments, it may be asked? For these general reasons—that light, not heat, should predominate, that light and heat together are inconsistent with the sentiment of such a room, and, further, that true green is not only bilious of temper but almost fatal to mixed combinations. Next consider the *dining room*. Its modern purposes are chiefly displayed by artificial interior light, hence white plays but a humble part in its treatment. Red tones for comfort and warmth are most natural. Red also, although classed as a stationary colour, is safer in practice when toned down with black, or in positions naturally shaded. Try a mass of fiery red, then add an equal proportion of black and note the resulting sentiment, "prudent heat"—red toned with black. Again, add white to red, result—heat still too powerfully dominant. *Halls* and *staircases* are not used for living purposes, hence their colour expression may not be so arbitrarily stated. If well lighted by Nature we must restrain our hand in the positive sentiments generally; but if badly lighted, then we aim to give expression to brilliancy and cheer. In our own country, where dull and cheerless weather predominates, the warm and cheerful tones are the most successful. The *study* and *library* are open to much divergence

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of colour treatment. Either of the positive colour sensations are in keeping with the use of the room; but expediency must be studied, and unless the natural light is very poor, white and yellow are "bad language." The book or the epistle is the mind's light and cheer; the surroundings, therefore, must not rival its attraction. In *sleeping apartments*, pure and simple, white must stand pre-eminent as correct expression. The pure slumber of childhood, hopeful hearts for greeting the possibility of each day, and the wished-for brightness and freshness of morning are thoughts at one with its use. Nevertheless, we wish not for either in the extremity of their force and agitation, and probably prefer the dominant white toned down with a little warmth (red), or the soft peace of truth and repose (blue); or, again, if our apartment is badly served with Nature's brilliance and strength, we may surround us with *blithe* yellow.

We have now discovered how our homes may be made pleasing *melodies* of colour—visual expression of our minds. But we have not learnt of the *harmonies*, the chords, so to express it, of poetic colouring. The little of this that can be taught by pen and ink is still far too much for this paper. The fringe of the subject we, however, must touch, in conjunction with the foregoing and this with respect to contrast. Good *contrasts* in *colour* are such opposing sensations as heighten and improve each other when juxtaposed; contrast is therefore an important feature in harmony, corresponding to the factor, *interval*, in music. If we have various sentiments of colour under one roof, we also must have satisfactory contrast between them. It has been before stated that in perfect vision there are colour nerves—nerves excited by distinct colour. If one's eyesight is minus its red colour nerves, colour blindness to red is the result; so with other colour. If we tire the red colour nerves by long-continued gazing at red, the remaining nerves which combine with red to convey to us perfectly balanced or "white" sensations have still their strength unimpaired. From this cause, when we glance rapidly from a spot of red upon a field of white to a surface of all white, the space corresponding to the former spot is tinged with the corresponding tint of the unexcited colour nerves. The simple diagrams shown on page 689 will provide experiments for the interested. The scientific aspect of colour contrast concerns us here in this much—that due allowance must be made for it in "home" colour schemes, otherwise we may be disappointed in the complete *ensemble*. For instance, colour a dining room red, of any intensity. Have the hall, or room approach, afterward coloured intense green-blue. The result will then be that the red appears doubly intense and brilliant after looking at the hall colour. Harsh or strong contrast is a matter irrespective of harmony, like a chord, *piano*, and then the same again, *forte*. We live in an age of temperance and moderation, therefore let our colour contrasts be consistent therewith; not autocratic and overbearing in sentiment, like the ancient Egyptian and Chinese colourings, nor depraved and sensuous like the Pompeian, but simple, temperate, and expressive.

For our diagrams on contrasts and complementaries we have borrowed from that invaluable little volume, "Modern Chromatics," by Ogden N. Rood. Although it may not happen that many of our readers will continue the search for colour enlightenment, which we have here endeavoured to initiate, by studying the modern works of Professors Rood and Church, we hope that these results will be found in each case—viz., a perception that untrained "taste" alone, in dealing with *colour*, is little more than an imprudent usurper of the province of study and experience; and further, that successful combinations and colour-studies require something more than a haphazard shuffle of the colour-cards or their accidental kaleidoscopic re-arrangement.

SHORT LESSONS IN WOOD-WORKING FOR AMATEURS.

BY B. A. BAXTER.

SETTING OUT—HALVING—DOVETAIL HALVING.

ALTHOUGH the two forms of joining wood already mentioned are of great importance, being so frequently used, halving and dovetail halving are of great use in many cases, especially where alterations and additional rails are to be placed in a piece of work already glued up. In such a case, mortise

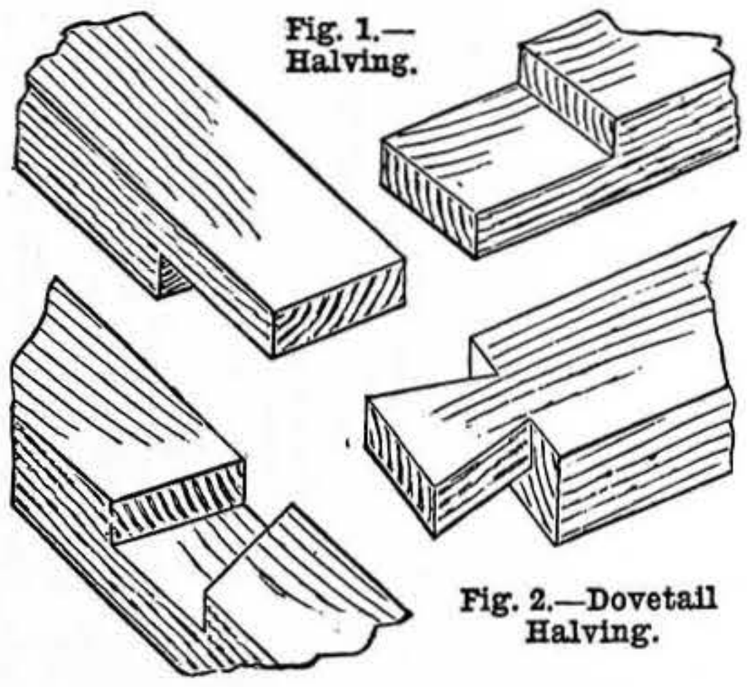

Fig. 1.—Halving.

Fig. 2.—Dovetail Halving.

and tenon are out of the question. The setting out for halving is simple, but must be well done to obtain good results. A mortise gauge is not required, but a finely sharpened marking gauge. As halving, so called, need not be exactly what its name implies, the part cut away in each of the pieces may be modified as any special circumstances direct. The gauge is to be applied to the marked surfaces of the wood, cutting up to the lines when making the joint; in one case the front is cut away, and in the other the back. At exterior angles halving needs the assistance of glue or nails, etc., as, unlike dovetails or tenons, there is no retaining property in the joint itself. Nor is dovetail halving much better in this respect; but where halved or dovetail halved joints occur in other places—that is, at the end of one timber and somewhere between the ends of the other—there is a retaining power, and therefore the joint is stronger. I have seen frames for overmantels, all the joints halved and glued, and when slight inequalities of either pieces were removed, and the whole overlaid with ¼ in. walnut glued on, the rebates for glass being formed by the walnut being wider than the pieces composing the frame, a simple but strong construction results. Dovetail halving only differs from halving in the form of the tongue or end, which is cut with the reversed wedge shape which is common to dovetails; only one dovetail is, as a rule, required, and the best use of the joint is when two pieces are to be joined like the letter T. This joint also can be used for work in progress, without the unbuilding which a mortise and tenon would involve.

It is not easy to separate the setting out of this joint from the work of doing it, because the dovetail is generally sawn by the aid of the eye and judgment of the worker, and the socket made afterwards, either by marking with the saw *in situ*, or with a fine scriber or a well-pointed pencil, on the piece of wood in which the socket is to be cut. It is best, however, to mark the intersection of each piece on the other, for such lines form part of the shoulder of the dovetail. When the pupil has mastered these joints he will be able to make a bench, and in so doing he will use each of those already mentioned. The legs will be united in pairs by mortise and tenon, while a continuous sideboard may with advantage be dovetailed at each corner. The cross pieces at the top of the legs may be halved or dovetailed, and the rails which support the top may with advantage be dovetailed or dovetail-halved into the sideboards.

WIRE-WORK IN ALL ITS BRANCHES.

BY JAMES SCOTT.

TOASTING-FORKS—BLOCK FOR FORMATION OF FOUR-PRONG FORKS—THREE-PRONG FORKS—MACHINE FOR TWISTING FORK WIRES—GRIDIRONS—THEIR FORMATION—STEAK-TOASTERS—GRAVY PANS, ETC.—THE FRAMES—THE HOOKS—LADLES—THE FRAMEWORK AND SPRING—STRAIGHTENING WIRES—SECOND KIND OF LADLE—FRAMEWORK, ETC.

Toasting-Forks.—In the winter, when a blazing fire is exposed in full glare before us, and we can hear the horses' hoofs continually slipping over the icy roads outside, amidst the struggles of the unfortunate animals; when the hands and face are scorching hot, the eyes dried up, and the vision obliterated by the heat of the fire; and the toes feel cold and are covered with chilblains, while a cold shiver runs up the back now and again, travelling no one knows whither—then is the time when a slice of toast is welcomed, with a cup of tea.

Several of us, no doubt, can testify to the personal discomfort experienced when the operation of toasting is performed by means of an ordinary dinner fork. The fire *will* burn our fingers—and the toast in addition. The man who first invented toasting-forks truly deserves our gratitude. How he was accustomed to make them I cannot tell, but they are at present extensively made in the manner I am about to describe.

Block for Formation of Four-Prong Forks.—A wooden or metal block, with four holes drilled through its length (as represented in Fig. 158) is fixed in the vice. Two wires of the proper length are bent as in Fig. 156, their ends being level with each other. A twist is given to the top by means of a small rod (A in Fig. 159), making that part appear as in that diagram. Each of the four lengths is then passed through a hole in the block, as shown in Fig. 158. The rod A (Fig. 159) is inserted in the loop at the end and turned round and round, as in winding a clock. The wires are consequently regularly bent or twisted round each other. When they are twisted a certain distance they will be as shown in Fig. 164, the two outer ends at this point being bent outwards, as appears in Fig. 164, and the two inner ends in a similar manner. The outer ones are again bent as in Fig. 165, and the inner ones also again

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as in Fig. 169. The final bending is accomplished by their being placed under a cylindrical object and the remainder of the fork bent upwards, appearing afterwards at the prong ends as in Fig. 168. A wire is then secured across the prongs for purposes of strength.

Three-Prong Forks.—Three-prong forks are very numerous, and can be made in a somewhat similar manner to the four-pronged articles just described. Instead of four there must in this case be three holes in the block (as in Fig. 160). And there will also be three wires of the same length as each other. One end of each wire will be bent as in Fig. 157, and all three passed over and under each other as there represented, in order to make a secure and strong job. All are, of course, pushed close together, my purpose for showing them open being to give a clear view of the manner in which they are interlaced. The wires are then placed through the holes in the block, and served in a similar way to the wires composing the four-pronged forks. The instructions given in reference to the latter will be equally applicable to those at present under consideration, with the exception that the middle wire is only bent once, and that as in the curve shown in Fig. 168.

These forks are made in a great variety of lengths. When a particular size is decided upon, a large amount of superfluous wire should be allowed to remain until the rest is twisted up, as during this latter operation, the four or three lengths of wire, as the case may be, will twist up into a much shorter length than they will originally be.

Machine for Twisting Fork Wires.—For the sake of expeditious manufacture an arrangement similar to that shown in the drawing could be utilised. A comparatively heavy block, such as, for instance, one made of iron, would have to be used in conjunction with it in this case. A reference to my article on "Twisting" must be made. It will there be seen that this simple contrivance corresponds in a great number of particulars to the one there shown, therefore, the remarks I make in relation to the one described in that paper can be appropriately applied where necessary to the one given herewith. The difference between the two can be seen. The arrangement fitted on the one at present requiring further description is intended to receive the loop of a toasting-fork in order that it may be turned, and thereby twist the wires, by being placed over the rod, B (Fig. 166), and the handle then revolved.

Fig. 166 shows the arrangement by itself. A is a hinged plate, shown alone partially in the same sketch. The rod, B, revolves in a socket at each end, and at the top end of it there will be a catch, as shown in Fig. 166. When about to place the fork loop on the rod, B, the latter is turned in order that the catches may be released, and the plate, A, is lifted. When the loop is upon B, all is again replaced as in Fig. 167.

It is understandable that with such a wheel as this the wires can be twisted in an exceedingly shorter period of time than by the more laborious and tedious manner just described.

The wire trade does not vary from other industries in so far as the various modes of procedure connected with it are concerned; for it may happen that several shops have different processes which they are in the habit of following for the manufacture of the same description of articles. When a master, foreman, or workman hits upon an idea for obtaining by a new method certain results in a particular direction, it is the earnest desire of all connected with that shop to keep such as a secret from outsiders: thus it happens that a description of certain work performed in a certain manner in one shop would be scorned by workmen in some other places, for the simple reason that they are used to doing things somewhat different. Sometimes it will be found that a majority of shops follow a particular method, and wonder is created as to how it is that the minority are ignorant of their fellow-workmen's procedure. Why is it? Because each shop jealously guards its acquired knowledge, and thinks that but a few possess the same information; and if it were not for the fact of workmen leaving one shop and entering another and communicating the secret to their new fellow-workmen, such trade items would still remain unknown to outsiders.

I have slipped these few notes in because it has just struck me that some wire-workers may find that many of the modes here described differ somewhat from those they may have been used to following to obtain the same results.

Gridirons. — The homely gridiron is a very useful article, but its brother, the steak-toaster (honoured by other names as well as this), excels it in a great measure. The first is made, like the proverbial cat is killed—in more ways than one. A few years ago a man used to parade the streets with a quantity of stout, straight wires in his possession, and when he had collected an appreciative and apparently speculative audience, he commenced work by taking a straight wire from his bundle, quickly twisting it by the humble aid of his fingers only, and in almost as little time as it has taken me to speak of him, he had formed a gridiron similar in appearance to that shown in Fig. 145. He certainly deserved what he obtained—a ready sale for his impromptu manufactured goods.

Their Formation.—I am not going to ask any of my readers to perform the task in this manner, although it is really not a difficult one; it was the celerity with which the man accomplished his work which surprised his onlookers. A block, similar to that represented in Figs. 142, 143, and 144, will be required for accurate work. A straight

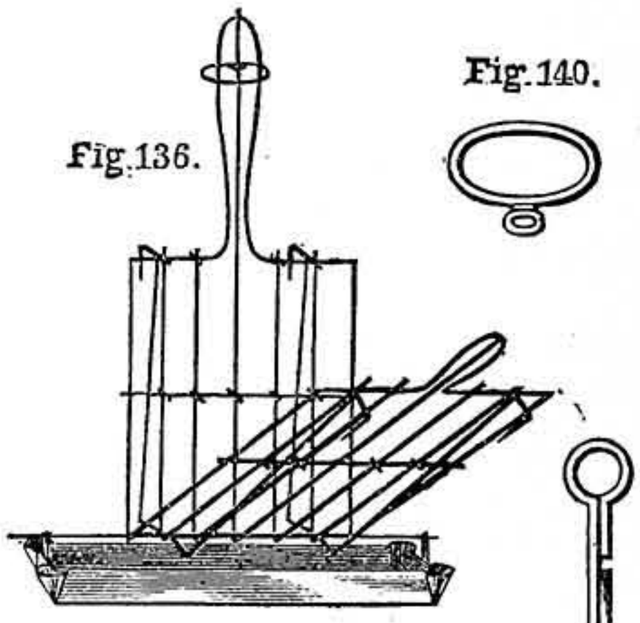


Fig. 136.

Fig. 140.

Fig. 137.

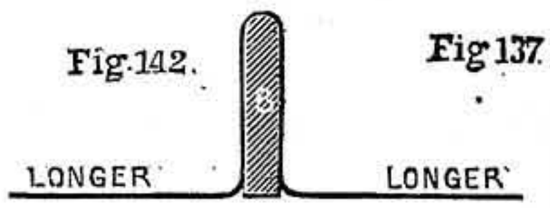


Fig. 142.

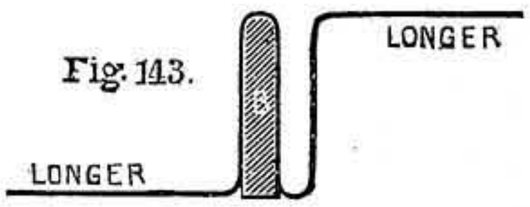


Fig. 143.

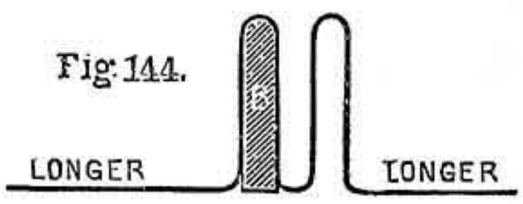


Fig. 144.

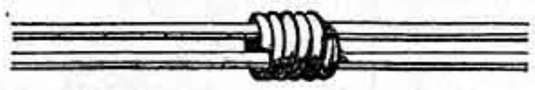


Fig. 135.

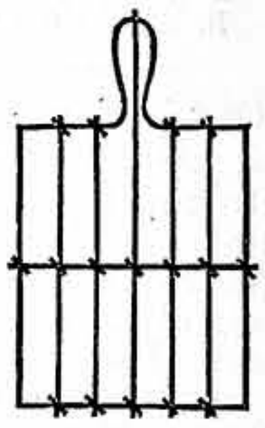


Fig. 139.

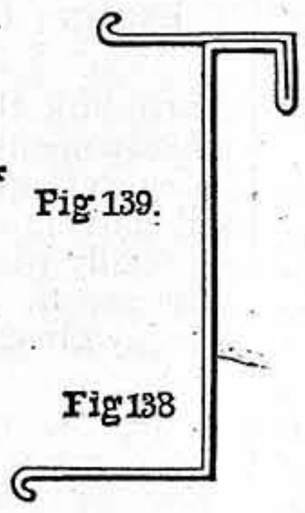


Fig. 138

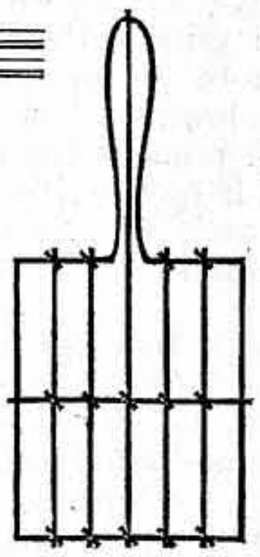


Fig. 141.

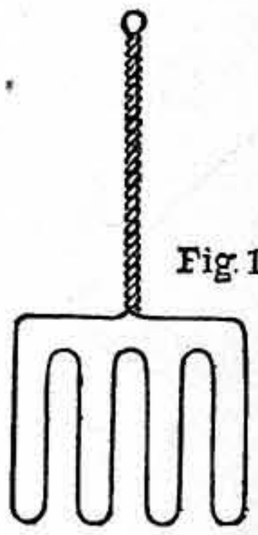
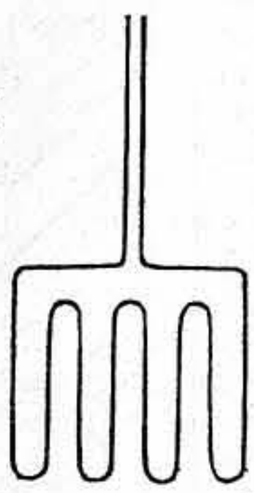


Fig. 145.



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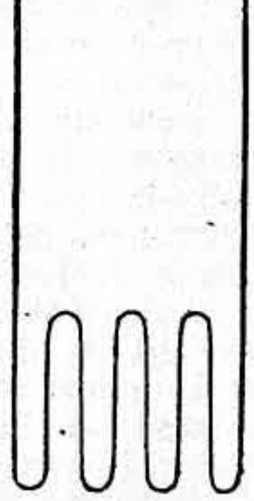

Fig. 147.

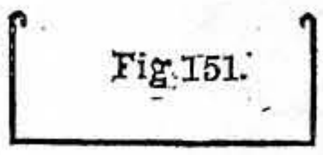

Fig. 151.

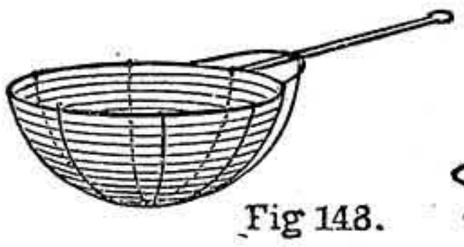

Fig. 148.

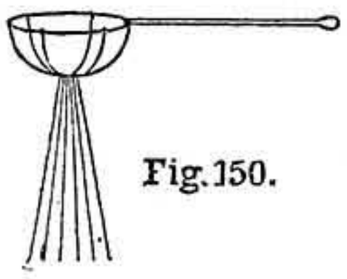

Fig. 150.

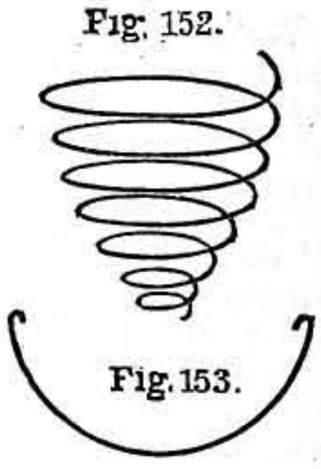

Fig. 153.

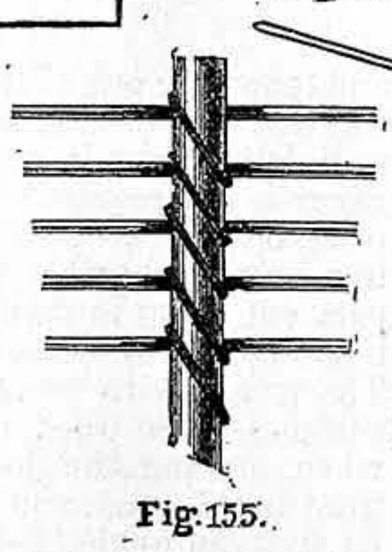

Fig. 155.

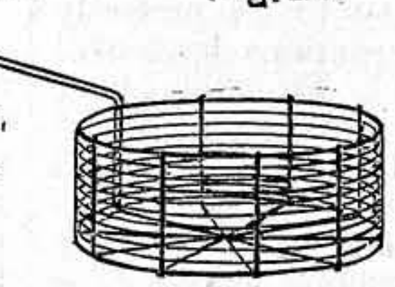

Fig. 149.

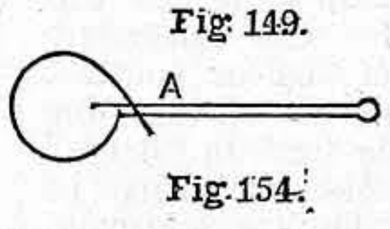

Fig. 154.

Fig. 135.—Hinge for Steak-Toaster. Fig. 136.—Steak-Toaster. Fig. 137.—End of Gridiron Handle. Fig. 138.—Hook for Steak-Toaster: four required. Figs. 139, 141.—Frames of Steak-Toasters. Fig. 140.—Drop Catch for Toaster. Figs. 142, 143, 144, 146, 147.—Various Stages in Formation of Gridirons. Fig. 145.—Gridiron. Fig. 148.—Vegetable Ladle. Fig. 149.—Alternative Pattern for ditto. Fig. 150.—Lacing Wires hanging loosely on Handle. Figs. 151, 153.—Framework Wires of Square and Round Ladles. Fig. 152.—Ladle Spring. Fig. 154.—Ladle Handle, etc. Fig. 155.—Section of Ladle.

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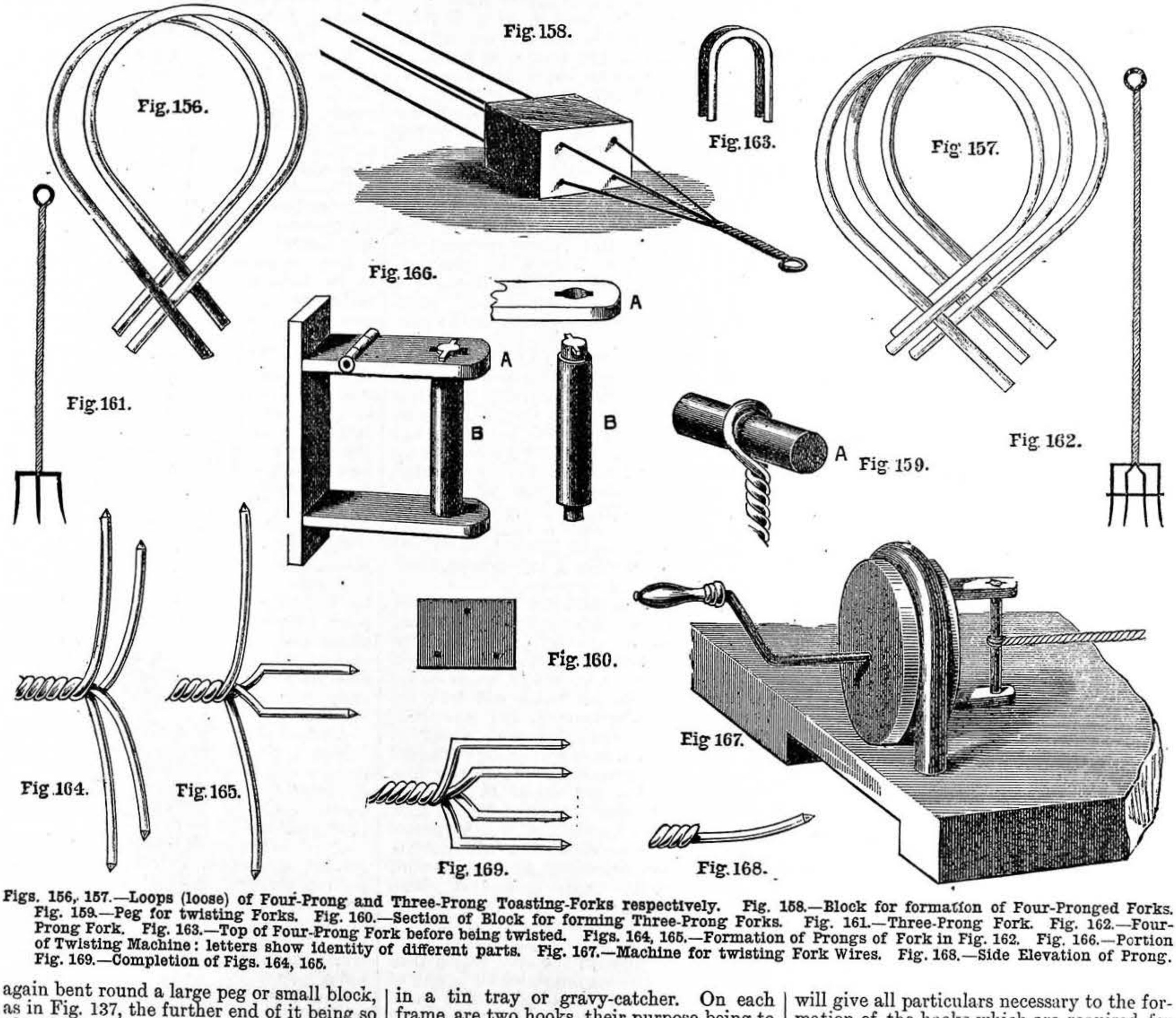
wire would first be bent round it as in Fig. 142, in which diagram B is the block. The wire would then be reversed and bent round the block as in Fig. 143. Next it would again be reversed and bent, as in Fig. 144. These operations would take place until the sufficient number of bends had been accomplished. It would then appear as in Fig. 147.

Each clear portion at the sides would then be bent twice, when the shape would be as in Fig. 146. These bendings would be performed by means of a peg driven into the bench. The longer portion would then be shown in Fig. 140. The latter is attached to the wire just mentioned by means of the small eye in it. The front frame is secured to the back one by having three or four pieces of wire twisted around both, as in Fig. 135, thus forming hinges for them. When the steak or other commodity is to be cooked, it is placed between the frames, and the ring wire which travels up and down the longer handle falls over the shorter one, and retains both frames firmly together.

Gravy Pan, etc.—Between the frames at the bottom is placed a long loose wire, the ends of which pass through holes or staples handle inclusive, and is turned over in the usual way. Four other wires, two at each side of the long one just alluded to, are also turned over on to the frame, and duly laced, in addition to the latter. Five wires are sufficient for the front frame, and will be turned over and laced similarly to the others. Sometimes a lesser or a greater number of wire bars are used, but the number I state will be conveniently suitable. Across each frame will be a stay bar, also laced in position to strengthen the article.

The Hooks.—My notes on hooks in my paper on "Fire-Guards," recently published,



Figs. 156, 157.—Loops (loose) of Four-Prong and Three-Prong Toasting-Forks respectively. Fig. 158.—Block for formation of Four-Pronged Forks. Fig. 159.—Peg for twisting Forks. Fig. 160.—Section of Block for forming Three-Prong Forks. Fig. 161.—Three-Prong Fork. Fig. 162.—Four-Prong Fork. Fig. 163.—Top of Four-Prong Fork before being twisted. Figs. 164, 165.—Formation of Prongs of Fork in Fig. 162. Fig. 166.—Portion of Twisting Machine: letters show identity of different parts. Fig. 167.—Machine for twisting Fork Wires. Fig. 168.—Side Elevation of Prong. Fig. 169.—Completion of Figs. 164, 165.

again bent round a large peg or small block, as in Fig. 137, the further end of it being so placed that it may be parallel to the longest part of the remainder of the wire. The shaft would then be held firmly together by means of a wire twisted around it, or by a strip of tin being similarly twisted.

Steak-Toasters. — Let us take steak-toasters—pardon me, dear reader, should the pronunciation of these words result in a slip of the tongue. These articles are made in two separate movable frames, opening from the bottom similar to a book, the handle of one frame being much shorter than that of its fellow frame. Between the wire forming the longer handle runs a straight wire, upon which travels a ring of the shape in a tin tray or gravy-catcher. On each frame are two hooks, their purpose being to hold the toaster to the bars of the grate at which the delicious morsel within is to be cooked.

The Frames.—The shape of the front and back frames respectively are shown in Figs. 139 and 141. The wire composing each is bent round pegs to the required pattern, the handle being formed either round a block or by the aid of the pliers. It matters little at which point the ends of the wires finish to form these frames, but the corner I show will be as suitable as any. Then, both ends are either twisted around each other or simply hooked. A middle wire in the back frame traverses the whole length of it, will give all particulars necessary to the formation of the hooks which are required for steak-toasters, the difference between the two patterns being that the latter are much longer, have no intermediate eye-holes, and have a longer bottom bent portion, in contrast to the former. When they are fixed by having their ends squeezed down over the bottom and top wires of the frames respectively, the lower parts of them project and are the means of keeping the toaster's frames away from the bars of a grate.

Ladles.—Two of the commonest forms of ladles used for various purposes in connection with vegetables are shown in Figs. 148 and 149. I will take the form represented in Fig. 148 for our first consideration.

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The frame of it is shown in Fig. 150. The handle, etc., are made from one length of wire, so bent that the ends of it meet at a point near the part marked A in Fig. 154, where they are secured in the usual manner. To the circular portion of it are then attached two, three, or more nearly half-circular wires, so fastened that the knuckles of them are inwards.

The Framework and Spring.—Each loop or bend is so fixed that it crosses the others at a point terminating in the bottom of the article; and between each pair of knuckles the space must be exactly the same. The inside consists of a spiral spring (Fig. 152). I must ask my readers to refer to my article on "The Worm Block" in another number for particulars of the procedure adopted in producing spiral springs. As I there say, the spring will be extended in width. In fixing it to the ladle frame the lower end of it is tied or squeezed over the junction of the hoops, while the other part of it is placed properly within these hoops; and the top end, when cut at the right spot, bent over on to the circular top of the framework. It requires a little care to fix the spring neatly and accurately; but the operation cannot be said to be at all a difficult one to accomplish.

The spring has to be laced in position. It is usually the case that the necessary number of lacing wires are tied to the junction at the bottom of the ladle preparatory to their being finally secured. Each one is then worked along that portion of the ladle frame to which it is adjacent, and fastened off properly to the top of the frame. The second, third, and so on, are afterwards similarly treated, but each one is completely finished off before another is commenced; otherwise the lacing will not be done satisfactorily.

Strengthening Wires.—To give strength to the article, there are generally three extra wires attached; one passing from the handle to the bottom of the ladle, and each of the remaining two joined respectively to the straight and circular portions. The under one is sometimes straight.

Second Kind of Ladles.—The second form of ladle is perhaps the best for most purposes, on account of its having a flat bottom, thus enabling the user of it to rest it upon anything without fear of its toppling over, or the contents of it tumbling out, which would always be the chance if the round-bottomed ones are used. The remark that was made by Handy Andy concerning soda-water bottles, which he was pleased to say had no bottoms because they would not stand up, has just struck me; and I feel that I ought to follow the example of such a curious authority, and not allow myself to term any part of the first ladle as *round-bottomed;* and in truth there is something philosophical in Andy's ideas, for whoever would dream of speaking of the *bottom* of the world? But there! one must have names for things and parts of things, although a still higher authority has said, "What's in a name?" therefore I term them round-bottomed.

Framework, etc.—For the ladle shown in Fig. 149, a frame of the pattern there shown is necessary. My notes upon the round-bottomed articles can be applied to the construction of the flat-bottomed ones in every respect, with the exception that the under parts are shaped as in Fig. 151, and the handle sometimes bent as in Fig. 149. A spring is fitted within in a similar manner, the proper portion of it being flattened against the bottom of the ladle. The lacing will also be the same. Here I might remark that in Fig. 155 I have shown a section of a ladle when laced.

A USEFUL METAL LATHE.

BY SELF-HELPER.

PREPARING HAND-REST—T's—FLY-NUTS—BED—FLY-WHEEL—CRANK—PITMAN—TREADLE—DRIVING BAND—CONCLUSION.

THE *Hand-rest* casting may now be taken in hand, and is usually found to contain a good deal of sand and grit in the T-slot.

This should be cleaned out as well as possible, and the head of a half-inch bolt filed so that it could run easily from end to end. Sometimes little knobs of metal are found in castings, and if one of them is in the slot, it might cause a great deal of trouble, and should be now removed with a file. The sole of the rest must be made true, either with a file, or, what I find very efficient, a good grindstone. Of course, if it could be planed or milled, so much the better. The hole for the shank of the T-rest may now be bored. It is important that it should be at right angles with the sole, and to secure this the best plan is, I think, to clamp the rest against the face-plate of the working lathe, and bore the hole with a drill pressed forward by the back centre, or held in the slide-rest. A light cut taken off with an inside tool would true it still farther. A 6 in. centre lathe, or one swinging so much in the gap, would be required for this; but those who cannot get the use of such a tool may make a very good job by drilling the hole to a smaller size, and then enlarging it with a reamer. The hole, when finished, may be $\frac{3}{4}$ in. or $\frac{7}{8}$ in. in diameter; preferably the latter, if the shanks of the T's will turn up to that size. A little hole, $\frac{3}{8}$ in. in diameter, may now be drilled in the projection *b* (Fig. 10, page 453), and tapped to take a steel set-screw with a hardened point. Better arrangements for clamping the T-rest are sometimes employed, but this plan will do for all practical purposes.

T's.—With regard to the T's themselves, it is not easy sometimes to turn their stems, owing to the absence of a centre at the upper end; but if the amateur himself makes the patterns, he has it in his power to leave a projection which will take the centre during the turning, and can afterwards be removed. I turned a set of wrought-iron T's once by cutting a channel across a piece of wood screwed to the face-plate into which the top of the T went, the other end being supported by the back centre. This channel will not be across the centre of the wood, but will deviate more or less, according to the forward cant of the T. Some makers of cheap lathes have solved the difficulty of fitting the hand-rest by putting a cored hole in the support, and casting the T-stalk small enough to fit into it; the only fitting then necessary is the set-screw, which is one of the square-headed sort, at so much a gross. As we are not makers of cheap lathes, such a proceeding would be unworthy of us; but the suggestion may be worth something to a man whose spare time is limited.

With regard to the *set-screw*, it would be well to have its head spherical, with a hole across for a tommy; and if a fixed tommy, like a vice handle, were put in, it would be found very convenient.

Fly-Nuts.—At this stage the *fly-nuts* will be prepared. Holes must be bored in the bosses for tapping—$\frac{1}{2}$ in. for the hand-rest and $\frac{5}{8}$ in. for the poppet. If, however, the poppet is attached by means of a nut overhead, the fly-nut for the hand-rest only is required.

The hole being bored and tapped, it would be well to take a cut off the upper surface of the boss. This may be done by running it on the tap, or on a mandrel screwed for the purpose, and putting the latter between the centres of the working lathe. The surface so treated should not be quite flat, but slightly spherical, the centre thus bearing first upon the clamping-plate. It is scarcely necessary for me to say that the clamping-plate should have a hole made in it large enough to let the bolt pass freely through.

Mounting.—The heads of a lathe are of little service without being mounted, and so the bed, fly-wheel, treadle, and crank next demand our attention.

The character of the mounting may be determined by the success or non-success of the work so far completed. If the heads are worthy of it, a planed bed and turned fly-wheel may be got from some of the lathe-makers who advertise in the pages of this Magazine; whereas, if the heads have been put together in any sort of a way, and it is questionable whether they will ever work at all, the roughest wooden bed and fly-wheel may laugh them to scorn.

Bed.—A wooden bed is not by any means to be despised. If a piece of beech or mahogany, 2 in. thick and 4 in. or 5 in. wide, well seasoned and straight in the grain, can be got, it will make a very good bed. The top would be the better of being plated with iron $\frac{1}{4}$ in. thick, which could afterwards be filed smooth and bright; or T or L iron might be used, and a good strong section will serve well. In any case, the upper surfaces and inner edges should be as nearly straight and true as possible. A reference to my former papers on lathes in Vol. I. of WORK will teach a good deal as to the mounting of these heads.

Fly-Wheel.—It would be a distinct advantage to have a fly-wheel with several steps, as a piece of work of small diameter ought to be driven much faster than a larger piece. Such wheels can now be procured either cast in the rough, from 4s. or 5s. each, or turned, bored, and key-wayed, from £1 to 30s. The last-named run much smoother, and are well worth the difference in price.

A wheel about 26 in. in diameter at the largest step would get up a good speed, and if there was a small step of about a foot in diameter, a considerable amount of metal-turning could be successfully accomplished in this lathe.

Crank.—The crank best suited to a wood-turning lathe would, I think, run on centres passing through the legs, as such a plan produces very little friction. The centres of the crank should, however, be bushed with hard steel, as otherwise the points on which they run are apt to produce distorted holes.

The crank should be turned, at least where the fly-wheel comes, and, if appearance is aimed at, all over. A part very important, but usually neglected, is where the hook of the pitman goes. If this cannot be turned, and it is not easy to do so without some special apparatus, it should be filed with the aid of a semi-circular template, cut from a piece of tin or sheet iron to the size of the part on which the hook goes.

The bearing part should be about an inch long, and the hook of the pitman made of flat steel turned over to fit, tempered and hardened. The entire pitman need not be steel, a chain or piece of bent $\frac{3}{8}$ in. iron doing nicely for the lower part.

Treadle.—The treadle could well be a

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light frame of iron, pivoted, like the crank, to the back part of the legs, or attached with hinges to a bar running from leg to leg, as I formerly described.

A wooden footboard would be attached to the front of the treadle, to take the pressure of the foot during pedalling. The throw of the crank is an important item in small lathes. It should not be more than 2½ in. from centre to centre, which will cause the foot to move 9 in. or 10 in. A higher stroke than this is unpleasant, and causes the lathe to jar.

Driving Band.—The best driving band for any high-class lathe is certainly gut, which is secured with hooks and eyes at the ends. It may be shortened or lengthened by twisting the gut more or less. The hooks and eyes are screwed into the ends, and if a portion protrudes into the eye, it is charred off with a hot iron.

Conclusion.—If any of my readers make this lathe as it should be made, they will have a tool which will be a credit to them, and do work during their whole life.

I will be most happy to answer any questions on lathe building, or supply any details which I may have overlooked, through the medium of "Shop."

PHOTOGRAPHY AS A MEANS OF HOUSEHOLD DECORATION.

BY WALTER E. WOODBURY.

Transparencies.

According to a statement in a contemporary, there are at present upwards of 20,000 amateur photographers in the United Kingdom. When one considers, however, the pleasures to be derived from the art, the figures do not seem so startling. During my life I have met with many hundreds of persons who have taken up with photography as a pastime, and it has often struck me that there are few—a very few indeed—who ever try to turn their work to any useful account. They go through a lot of trials and inconveniences to master the art, and this done, their only desire seems to be to make a lot of silver prints of inferior quality, and stick them in an album. This album usually becomes the terror of their friends, as they are usually compelled to look through it upon each occasion of their visit, and have recounted to them by the amateur scores of hair-breadth escapes and awful and appalling difficulties which had to be encountered—usually told as apologies for the defects which are so plainly visible. I have been a victim of this kind several times, and having some slight knowledge of photography, have often smiled to myself at the awful crams of the "dreadful amateur photographer."

Now, there are so many ways nowadays that photography can be employed for really useful and ornamental purposes, that it really seems a pity that the amateur does not turn his attention to some of them; then, instead of being a nuisance to his better half (if he is fortunate enough to have one, of course) with his "nasty messy chemicals," he will be able to assist her in the ornamentation of the home. In order to be healthy and happy it is necessary that we be surrounded by beautiful things. If we are not fortunate enough to live in a part of the world where we can have trees, flowers, and beautiful scenery, we can at least have representations of them.

Now, in my opinion there is no pastime which affords so much pleasure and genuine satisfaction as that which leaves permanent records of ingenuity and skill. Every time we glance at some useful or pretty object, the construction of which has employed our leisure hours, the pleasure is revived. We recollect the difficulties we encountered and the energy with which we vanquished them, and thus gratification and delight are kept ever green. When, too, a friend rapturously admires some work of art over which we have spent days or weeks of time, with what pardonable pride and self-gratification is the heart filled when we remark in a cool, off-hand manner, "Oh yes, I made that myself," so that the friend will be led to imagine that to you the thing was a very simple task.

I do not think there is any art which lends itself as readily to so many applications. A member of our royal family has already discerned this. H.R.H. the Princess of Wales is an ardent amateur photographer, and has recently had constructed for her a china tea service decorated with views of Scotland made by herself. It is not, of course, possible that every reader of this Magazine is in a position to have 100-guinea tea services made with their photographs; it is my intention, therefore, to show how photography may be used in decorating the house, adding pretty ornaments, or converting unsightly objects into attractive ones, and all this without any very expensive outlay.

The first things we require are good and suitable negatives. Sometimes by scientific treatment indifferent negatives may be made to yield passable results, but it is always best to start with a firm and perfect base. The negative is the foundation, and, provided it be good, it will not be difficult to make almost anything we require from it. Let the amateur select, then, the best negatives he has in his possession.

Transparencies.—The first process we will consider is the manufacture of transparencies or positives on glass. There are many processes by which these can be made, the simplest being the exposure of an ordinary bromide dry plate under a negative to a gas flame, and developing with the pyrogallic or ferrous oxalate developer, the former giving brown tones, and the latter black. About the best plates for this purpose are the Paget Prize Plate Co.'s XXX plates. Chloride of silver emulsion plates, specially manufactured for lantern slides and transparencies, will be found to give better results than ordinary bromide plates. A great deal depends upon the colour of the transparency, and this is usually dependent upon the developing agent. To get warm black tones, use the following:—Solution I.: Potassium citrate, 200 grs.; potassium oxalate, 60 grs.; potassium bromide, ½ gr.; distilled water, 1 oz. Solution II.: Ferrous sulphate, 80 grs.; sulphuric acid, 1 minim; distilled water, 1 oz. Add these two solutions in equal parts before required for use. Another developer that gives very nice warm tones is this:—Solution I.: Magnesium carbonate, 76 grs.; citric acid, 120 grs.; common salt, 2 grs.; distilled water, 1 oz. Solution II.: Ferrous sulphate, 140 grs.; sulphuric acid, 1 minim; distilled water, 1 oz. In exposing the plate it should be laid on a printing frame behind the negative, and held about one or two feet from a gas burner. The exposure can be tested with pieces of emulsion paper usually sent out with the plates. No rule for it can, of course, be given, as it varies according to the quality of the negative, the rapidity of the plate, the strength of the illuminant, and the distance from it.

Perhaps the finest method of making glass transparencies is by the carbon or autotype process. This process is based upon the peculiar action of gelatine mixed with an alkaline bichromate to become insoluble when exposed to the light. Sheets of paper coated with gelatine containing a suitable pigment are required. These are obtained from the Autotype Company, and may be had either plain or sensitised. If purchased ready sensitised it should be used as soon as possible, as it does not retain its good qualities for any great length of time. It is better to purchase unsensitised carbon tissue for transparencies, and sensitise it in small quantities as required. This is done by immersing it for two minutes in hot and three minutes in cold weather, in: Potassium dichromate, 1 oz.; liquor ammonia sp. g. ·880, 5 drops; distilled water, 20 oz. It is then dried and preserved in an air and damp-tight box. In printing, pieces are cut to the required size and laid behind the negative on the printing frame. The action of the light being invisible, an actinometer will be necessary to judge of the right exposure. It will be necessary to print much deeper than for ordinary carbon prints, as the images are to be viewed by transmitted light. While the printing operation is taking place the glass to receive the picture can be prepared. This should be of good quality, colourless, and free from bubbles and defects of any kind. It is first well cleaned, and all trace of greasiness removed. It is then coated with a solution made as follows:—Soak one ounce of Nelson's gelatine in one pint of cold water, and when thoroughly swelled, place the vessel containing it in a pan of hot water, and gently dissolve it. Next add sufficient potassium dichromate to give it a golden sherry colour, vigorously stirring the solution the whole time the addition is being made. While warm the glass plates are coated with it and dried in the daylight. We have now the exposed tissue and the prepared glass. These are both placed under water. The tissue, after it has curled up, and again become flat, is laid face downwards upon the gelatine surface of the glass, and the two are withdrawn from the dish. The tissue is then pressed well into contact with the glass by the aid of an indiarubber squeegee. They are then placed between blotting boards for a few minutes, and afterwards immersed in a bath of hot water raised to a temperature of about 105 deg. Fahr. When the pigmented gelatine begins to ooze out from the edges it will be found possible to strip away the paper which had supported the gelatine, leaving most of the latter upon the glass plate. By next laving the warm water on the glass plate all the soluble parts of the coloured gelatine may be washed away, leaving an insoluble picture firmly attached to the glass. It may be found necessary to increase the temperature of the water slightly, especially if the tissue has been somewhat over-exposed. As soon as development is complete, or, in other words, as soon as all the soluble gelatine has been washed away, leaving the image perfect and clear, the plate is thoroughly rinsed under the cold water tap and placed in a bath of: Powdered alum, 1 oz.; water, 20 oz. This has the double effect of hardening the gelatine and discharging the yellow colour produced by the dichromate salt. This glass plate, with the image, is now well washed in cold water, and, when dried, is ready for mounting. This is done by first procuring a piece of ground glass and binding the two together with thin black

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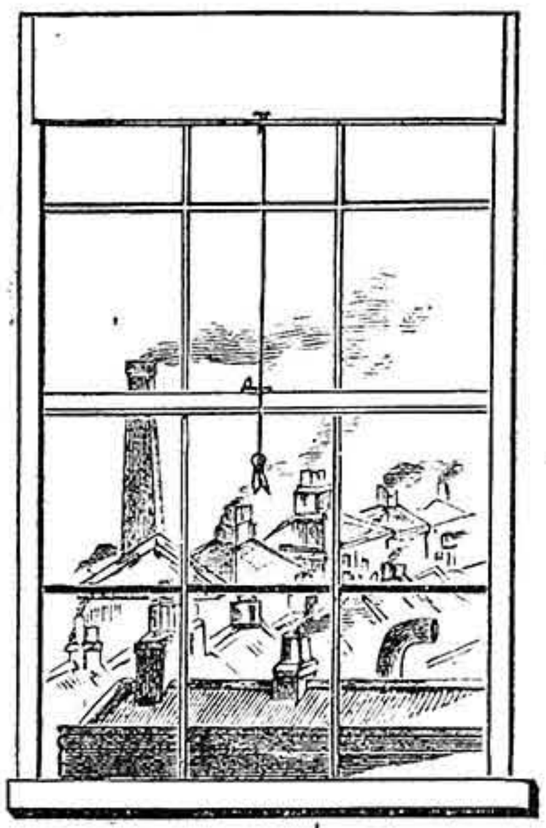
gummed paper. Small thin strips of cardboard should be fixed round the edges to prevent the two surfaces from touching.

Transparencies produced by any of these processes can be fitted into neat brass frames made for the purpose, and, if hung in a window, form a very pleasant relief to the eye. Indeed, the windows offer a very large and attractive field for decoration. If a room is nicely and tastefully furnished, the blank left by the window is in many cases a shock to the eye unless it looks out upon a lovely and pleasing scene. In order to relieve this, a framed transparency hung in the window often acts like a charm. Fig. 1 will give some idea of the appearance of a transparency framed complete.



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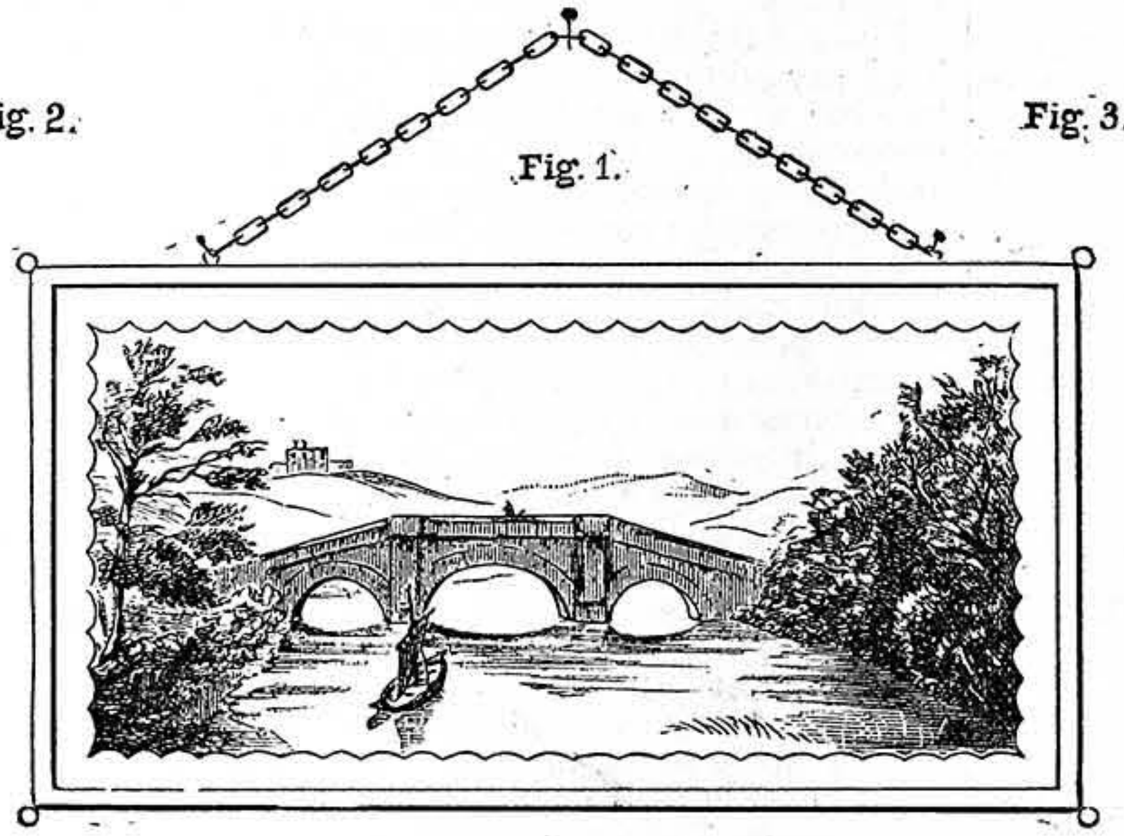
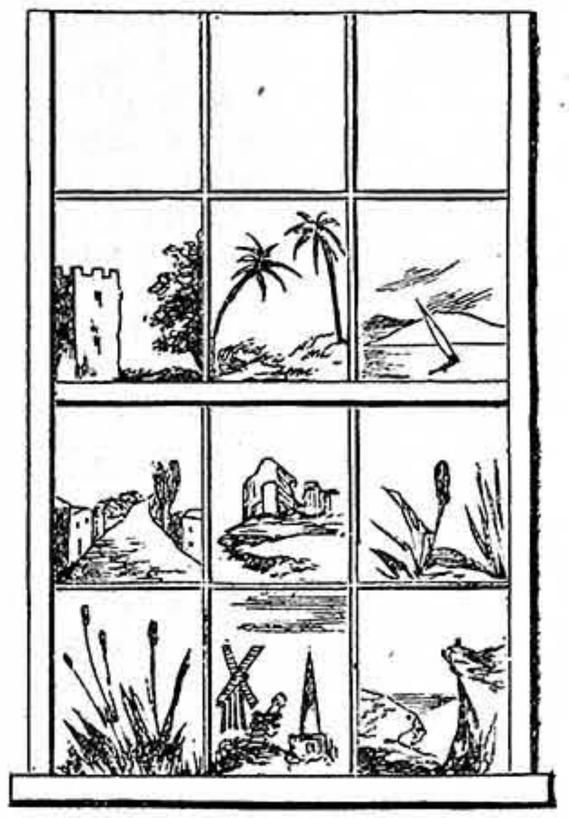


Fig. 1.

Fig. 3.



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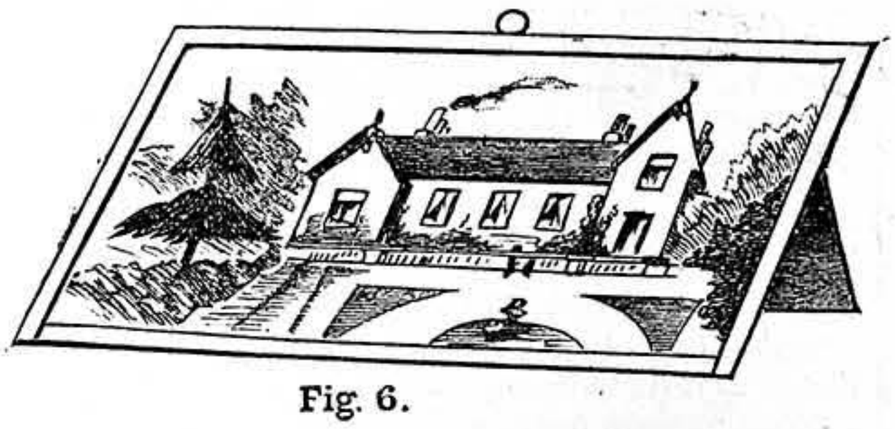

Fig. 6.

Fig. 5.

Fig. 1.—Framed Transparency to hang in Window. Figs. 2, 3.—Window Sashes treated as Transparencies. Fig. 4.—Hanging Lamp formed of Transparencies. Fig. 5.—Lamp Shade of Transparencies. Fig. 6.—Transparency framed with Sap.

There are few, I fear, who have the good fortune to dwell in a house the windows of which all have pleasant outlooks. In London we are often driven to gaze for ever upon extensive and decidedly unpicturesque views of tiled roofs, smoking chimney-pots, etc., occasionally relieved by the appearance of a few stray cats in search of a convenient place to hold their nightly concerts. These unsightly windows are often filled in with coloured glass or transparent paper, which, unless of superior and costly quality, rarely present any very pleasing effect. Much superior is the photographic transparency. By inserting positive transparencies produced by any of the methods previously described, and fixed in with putty, the distasteful view of chimney-pots entirely disappears without the light being obstructed to any very serious extent. Figs. 2 and 3 will give some idea of a window before and after this treatment.

There are a variety of other uses to which these transparencies may be put. The ordinary hall lamp will rarely suffer by the removal of the glass panes and the insertion of artistic glass views. Fig. 4 will give some idea of a lamp thus decorated, or a very effective lamp shade for an ordinary lamp may be made with a little ingenuity. Any brass-worker will construct the framework, when the transparencies have only to be cut to the required size (see Fig. 5). Smaller shades can be made, and are very effective for a card table or reading candles.

There is one special point to be noted in the manufacture of these ornaments which are subjected to heat—the glass used must be of a good quality and free from air-bubbles; and, further, it must not be made to fit too tightly in the framework, otherwise the expansion by heat will crack it.

I am fully aware that I have not yet enumerated one-half of the uses to which these transparencies may be put for household decoration, but the ones I have given will, no doubt, suggest many others to the reader.

We will now pass on to the uses of ordinary silver prints for our purpose. Every amateur knows how to make these, so no instructions will be necessary. Silver prints, however, even when mounted on cardboard and rolled or burnished, do not form a very attractive ornament. They soon curl and twist about into all sorts of shapes, and appear also to collect all the dust and dirt that is possible. A very effective way of showing off photographs is to mount them in optical contact with glass. The bevelled glass, with backing of leatherette paper leg to stand upon, with a ring to hang to the wall, can be purchased complete, it only being necessary to mount the print. This is done in the following manner:—After the prints have been toned, fixed, and well washed, the superfluous water is blotted off and they are placed between blotting-boards under pressure to dry. Now soak about 2 oz. of gelatine in cold water until it is all swollen, then add sufficient boiling water to make a thickish solution. When all the gelatine is dissolved, filter the solution through a piece of fine muslin or flannel into a porcelain dish standing in a hot-water bath, the temperature of the gelatine solution being kept by this means at about 100 deg. Fahr. The glasses are thoroughly cleaned, all trace of greasiness removed, and the gelatine solution carefully skimmed to remove all bubbles and scum. A print is now laid in the gelatine solution, avoiding the formation of bubbles, and when quite soaked it is removed and laid quickly on to the glass plate. With an indiarubber squeegee it is next pressed well into contact with the glass, and then allowed to dry. The prints should be cut slightly larger than the glass plates, so that after they are dry they can easily be trimmed with a sharp knife to the exact size of the glass. The pictures are made more effective if vignetted or masked, so as

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to leave a white margin all round the edge of the glass. When the protective backing has been pasted on they form very artistic ornaments for the mantelshelf or sideboard (see Fig. 6). This method of mounting the print adds considerable brilliancy to it, and also serves to protect it from dirt or atmospheric influences.

SOMETHING MORE ABOUT SUSSEX "TRUGS."

BY "CHOPSTICK."

INTRODUCTION—KIND OF WOOD REQUIRED—THE WALKING-STICK "TRUG"—THE "CAUL" OR WOOD "TRUG"—THE STABLE OR FEEDING BASKET—THE COAL BASKET—THE LADIES' WORK BASKET—DO., WITH FOLDING HANDLES—THE PARCEL-POST BASKET—FLOWER POT—DOLLS' CRADLES—BUTCHERS' TRAYS, ETC. ETC.—CONCLUDING REMARKS.

Introduction.—The number of letters and inquiries I have received since my previous paper on Sussex "Trugs" appeared in WORK (see No. 85), encourages me to think that the readers of that paper take some interest in the subject, and as I have reason to believe there has been, or will shortly be, several manufacturers starting in the business, I will endeavour to describe some other very useful, and also some very ornamental, forms of the "trug."

The Kind of Wood Required.—In my former paper I mentioned chestnut, and ash for the rims and handles, and "sallow" for the boards, but these seem to be difficult kinds of wood to obtain in some parts of the country; or, at any rate, the chestnut and sallow are. The ash, I should think, could be obtained anywhere. I have been asked by several correspondents to mention a substitute, but that is rather a difficult matter to do, though I think that alder might answer; but, again, I am afraid that would be as difficult to procure as sallow.

I mentioned the American bass or white wood to one of my correspondents, though whether that would cleave or not, I do not know. If my readers can find no wood suitable, I would advise them to get the toughest wood they can find, and get it sawn into boards as thin as possible. This will require more care in putting the boards in, but otherwise I do not see why it would not answer as well as the cleft boards.

The Walking-Stick Basket (Fig. 1).—This, I think, is one of the latest novelties brought out in the "trug" line. Visitors to the Edinburgh Exhibition will remember it at once, as it was exhibited there. It is simply a combination of the trug with a walking-stick, and is very simple to make. First make the trug part, as per instructions in my former paper; only make it about 8 in. in diameter each way. Then make the stick, which is a straight piece of ash with the crook on the top, formed by steaming and bending in the same way as the rims and handles; then cut a hole in the bottom of trug, so as the stick will just go through; but before fixing the stick in, get from a turner's (if you cannot turn them yourself) two collars, as shown in Fig. 1, A (plan), and Fig. 1, B (elevation). Fix one of these on the stick, about 6 in. below the crook; then place the stick through the hole in bottom, so that the collar fits in the trug; then slip the other collar on the point of stick, and fix up close with a small nail, and the walking-stick is complete.

And now a few words as to its use. It is sold very largely in places frequented by tourists, who use it for fern and flower gathering, etc.; by geologists, for collecting specimens; by ladies, for fruit picking; and for many other uses too numerous to mention.

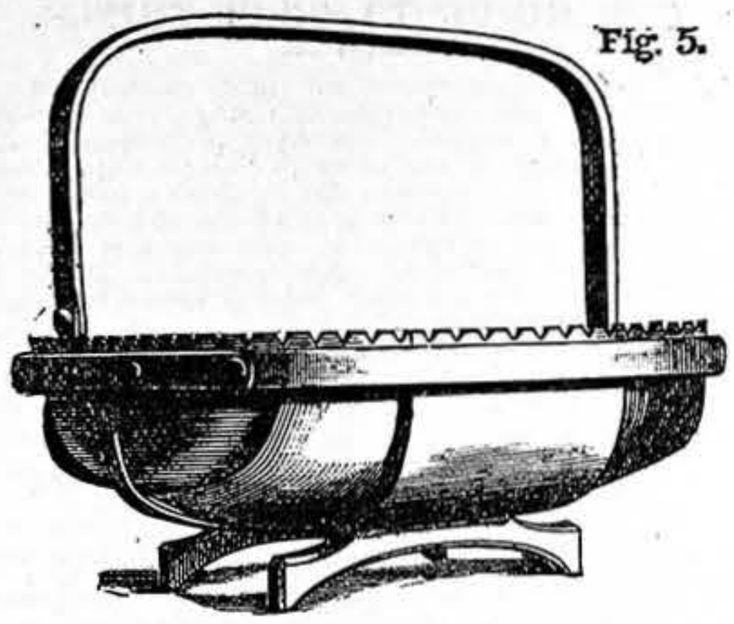

Fig. 1.

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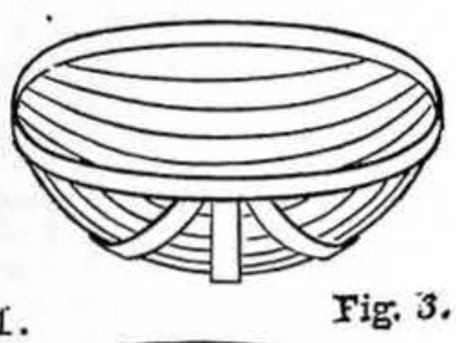
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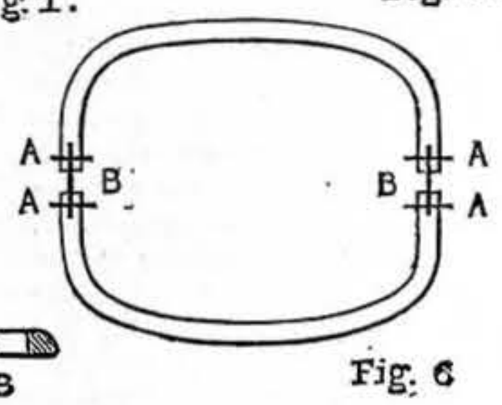

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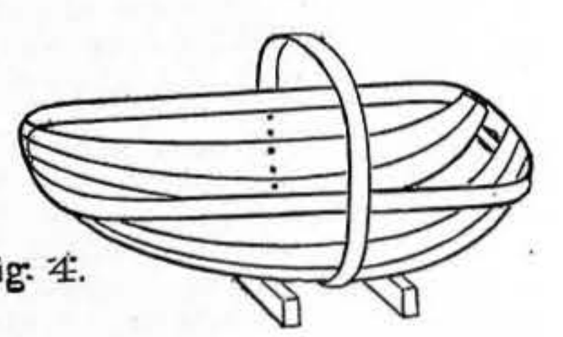
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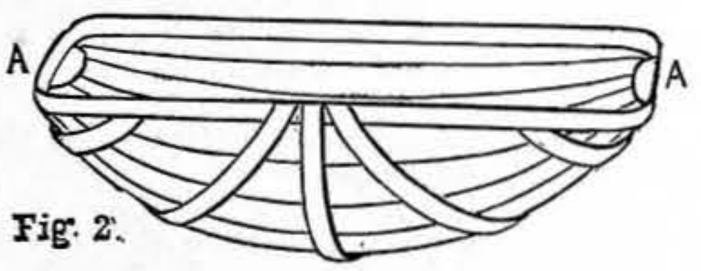

Fig. 2.

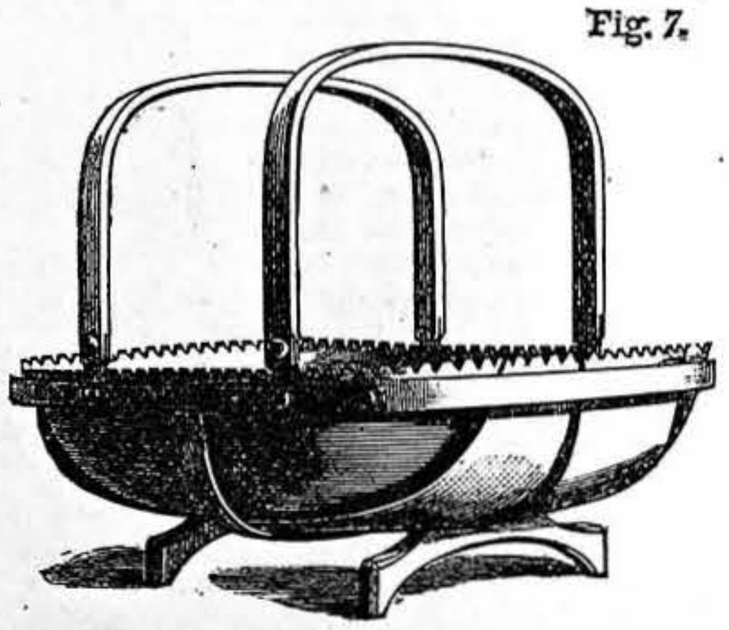
Fig. 7.

Fig. 1.—Walking-Stick Basket—A, Collar; B, Section of ditto. Fig. 2.—"Caul" or Wood Basket. Fig. 3.—Stable or Feeding Basket. Fig. 4.—Coal Basket. Fig. 5.—Ladies' Work Basket with One Handle. Fig. 6.—Detail of Folding Handles—A, A, Rivets; B, B, Small Pieces of Tin to form Hinge. Fig. 7.—Ladies' Work Basket with Two Handles.

The "Caul" or Wood Basket (Fig. 2).—This very useful basket I need say but very little about, as far as instructions for making are concerned, as it may be described as a trug of the common kind, only of larger growth. It is made from 3½ ft. to 5 ft. long; and as this would be a very unwieldy burden for one to carry, the handle is dispensed with, and instead a hand-hole is cut at each end, just under the rim (A, Fig. 2). This enables one person to take a firm hold of each end, and carry a considerable load of firewood or coal, or whatever it is being used for. You will notice that it has a rim the same as an ordinary trug, and instead of the handle going over the top, it stops at the rim, to which it is nailed. There are also two other rims (or rather braces, as they are called) on each side. The boards are thus nailed in five different places, which makes it very strong and durable.

The Stable or Feeding Basket (Fig. 3).—This form of trug has, I believe, been sold in thousands since its introduction a few years ago. It is, as its name implies, for the purpose of feeding cattle and horses in their stables, and is largely used by the army. I think this fact will convince anyone of its usefulness. It is made in the same way as the trug, except that it is quite round, and about 20 in. in diameter, the framework consisting of the rim and three braces, as shown in the figure. Further instructions are, I think, unnecessary, so I will pass to—

The Coal Basket (Fig. 4).—This is very similar to the common trug, except that it is made smaller at one end than the other, and the handle is placed closest to the wide end. A hole is also made under the rim at the wide end, in the same way as in the caul basket. This makes it very convenient for the purpose it is intended for—viz., to throw the coal on the fire, and thus dispense with the ordinary coal-scuttle and shovel. As this basket is made the same as the common ones, instruction is unnecessary.

The Ladies' Work Basket (Fig. 5).—These very handsome baskets are in great demand wherever shown, and are also used for many purposes, as well as the one mentioned. They are made in various sizes, ranging from 5 in. in diameter to 15 in., and are ornamented in various ways. I think, perhaps, I cannot do better than give a few detailed instructions for the making of these. The rims and handles are made on blocks in the same way as the common variety, but, of course, more care must be taken with the work, and they must be made much lighter. The boards also must be shaved as thin as possible, and a good finish is given to the basket by nailing them together with silvered upholsterer's nails. After the boards are put in, they should be trimmed round, about ⅛ in. above the rim, and then small notches cut with the knife. This gives the basket an ornamental appearance, without requiring much time to be spent on it. A good effect is also given by staining each alternate board a different colour. Needless to say, this must be done before the boards are nailed in.

These baskets are much improved by making the handles to revolve, or, more properly speaking, to fold down. This is effected by cutting the handle asunder, just above the rim, and inserting a piece of tin about an inch long, half of it in each part, with a tin-tack through each, which forms a hinge for the handle, and allows it to fold easily.

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If I have not made it quite plain, Fig. 6 will explain it clearly. B, B, are the pieces of tin, and A, A, A, A, are the rivets. Figs. 5 and 7 are photos of these baskets, showing them with one and two handles respectively.

The Parcel-Post Basket.—This I need say but very little about, as its use is not so general as the other kinds, though for those who send game or fruit, or anything in that way, by parcel-post, it will be found useful. It is simply two ordinary baskets without handles, hung together at one end by the rims, so that, when folded together, they form a box. The rims can be tied together at the other end, which makes all secure. The chief recommendation of this article is its lightness, which saves postage, and its strength, which secures the contents from harm.

The Flower Pot.—Very handsome flower pots can be made out of the same materials, and in the same way as the trugs, though, perhaps, they can hardly be called trugs. To make them, first make an octagon out of ½ in. deal, of the size that the inside of the flower pot is wanted: this will form the bottom of the pot. Then make a rim of the same size: this is to fix the boards to at the top. Then prepare eight boards, if a small pot, or sixteen, if a large one, and proceed to nail them, first to the bottom, and then to the rim, with silvered nails; then trim off, and ornament in the same way as I mentioned for ladies' work baskets; and when you see the effect, you will buy no more ornamental flower pots. These can be used either as standing or hanging pots, and can be finished off with enamel, which gives a very pretty effect.

Dolls' Cradles.—These can also be made of the same materials, but the trug maker will now have gained such an experience that this and many other useful articles will suggest themselves to his mind; and to take up space in describing the process of making, would only be to waste both my time and the reader's as well, and the same will also apply to the last article on my list—

The Butcher's Tray, which is so exceedingly simple to make, that I will leave it in your hands, and pass on to my

Concluding Remarks, which will be very few.—In the first place, I wish to mention that, soon after my first article appeared, I received a letter from a firm in the trade, whose intention, I have no doubt, was to get a free advertisement; but if this should meet their eye, they will see that I have mentioned no names, as it would be very unfair to the others in the trade for one to be mentioned and not the others. The firm in question very much wished to know where I got my knowledge, and for their benefit I beg to inform them that I have been through not only their own works, but I believe every other one in the trade. This statement should also give my readers confidence that I know what I am writing about. I have said all I can say about "trugs," but I will repeat what I have said before—that I shall be pleased to answer any queries that may be put to me through the columns of "Shop"; and if this paper brings me as many letters as my former one did, I shall be satisfied that my efforts are, at any rate, appreciated by the readers of WORK.

Those who have not yet gained experience in the work by actual manufacture, will note that if the cradle is to rock it will be necessary to put curved rockers under the tray itself, instead of the straight pieces of wood that are generally added to it as feet.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

102.—HODGSON'S REGISTERED DRAUGHT EXCLUDER.

I MAY begin by saying that ventilation is one thing and draught altogether another, and that although it is imperative to promote and find proper means for securing the former, it is equally incumbent on us to guard against the latter and all the ill-effects which arise from it. A simple and apparently effective appliance for stopping draughts is to be found in "Hodgson's Registered Draught Excluder," the nature of which may be easily recognised from the accompanying illustrations, in one of which—namely, Fig. 1—it is shown in position when attached to a door and the door is closed, and in Fig. 2 when the door is in course of opening. From these it will be noted that the Draught Excluder consists of two mouldings, one of which is attached to the door-frame and the other to the door itself, and as both are fastened to the *outside* of the door, there is no unsightly addition within the room, and the use of curtains or portières, which are often in the way, is rendered unnecessary. It will be seen from the sectional views of the mouldings, which are not very far short of full size, that the one which is affixed to the frame or stop, which forms the uppermost member of the frame, has a hollow taken out along the inner edge or side, and the other has a bead run along the inner edge of the upper surface, which fits closely and with exactness into the hollow in the edge of the first moulding. It is fixed up the sides and on the top, but it is not available for the draught which comes under the door, and which must be cured in some other way. The mouldings, it may be pointed out, are effectual in keeping out dust as well as draught, and are applicable for outside as well as for inside doors and windows. There are no springs, and nothing to get out of order, thus the mouldings are as simple as they are strong and durable. They are easily fixed, and as they are inexpensive, they are within the reach of the poorer sections of society as well as the richer. To fix them, it is first necessary to close the door, and then attach the mouldings to the hinged side, adjusting the same with care, so that it does not rub or bind in any way on the other, and then apply them to the top and opening side in the same way. They have been used by many persons in Settle, Yorkshire, where they were first introduced, and are spoken of by those who have tried them in terms of the highest commendation.

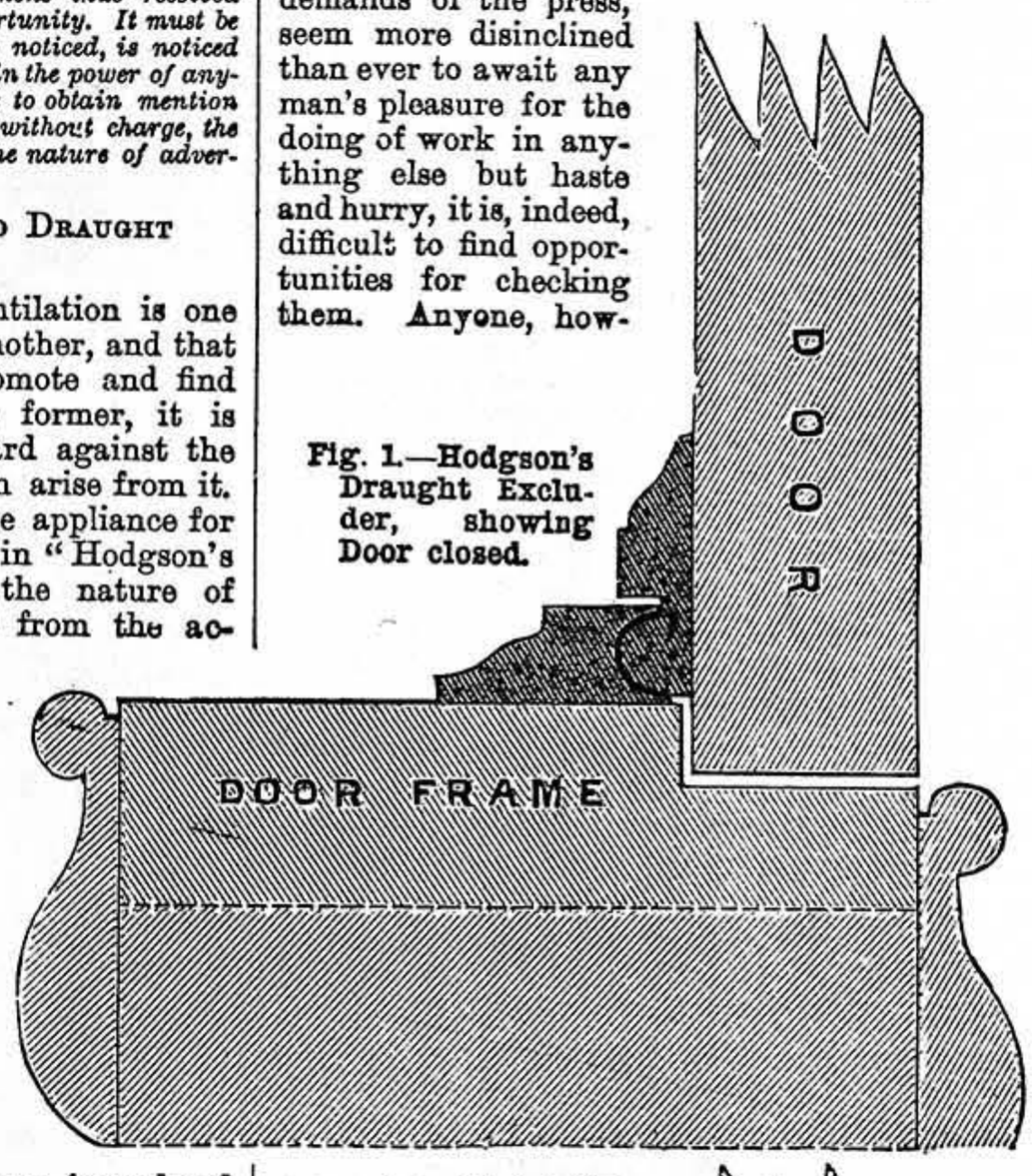

Fig. 1.—Hodgson's Draught Excluder, showing Door closed.

Fig. 2.—Hodgson's Draught Excluder, showing Door open.

103.—TABLES FOR ASCERTAINING AREA OF SUPERFICIES.

In a recent number of WORK, a Bradford correspondent inquired for joiners' and builders' tables showing the number of superficial feet in any given measurement of wood or glass. It is a feature that, if carried out at all in trade reckoners, has not been extended hitherto so far as to render the tables in which the matter is dealt with of any great use except in one instance, and that is in a broadsheet issued at a comparatively low price by "The Licensed Victuallers' and Hotel Keepers' Glass and Supply Company, Limited," which is somewhat inconvenient to use, although it is undoubtedly a step in the right direction. The correctness of the calculations given therein I cannot undertake to vouch for, and in the present day, when time and tide and, may I add, the imperative demands of the press, seem more disinclined than ever to await any man's pleasure for the doing of work in anything else but haste and hurry, it is, indeed, difficult to find opportunities for checking them. Anyone, however, who obtains the sheet and has a knowledge of the working of duodecimals can do this for himself, if he will take the trouble to try here and there the accuracy of the results tabulated.

104.—"THE AMATEUR."

I have to acknowledge the receipt of various trade journals whose names have been already mentioned in these pages. Among these, attention may be specially directed to "The Amateur." This useful publication, whose utility lies chiefly in its suggestions for the ornamental work that may be so easily done at home in making objects and appliances for its adornment, is still published by Mr. Henry Zilles. It still deals in, and with, subjects for the fret-worker, wood-carver, painter, inlayer, poker-worker, and other work suitable for persons of the class after whom the serial is named, and still holds its own against all comers set on foot to deal with these matters.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Hydrostatic Clock.—C. W. C. (*Stockton*) writes:—"I here give a brief description and sketch of a clock which I saw at an exhibition at Darlington a number of years ago. I think your readers will not fail to understand it. It was driven by the weight of water in a cylinder which had a spindle through it—each end of the spindle being suspended by thin cord. The cylinder was divided into a number of divisions, each division having a small hole to allow the water to pass from one to the other as the cylinder unwound itself from the suspending cords. So far as I can remember it had to be wound up every twelve hours."—[This idea is no

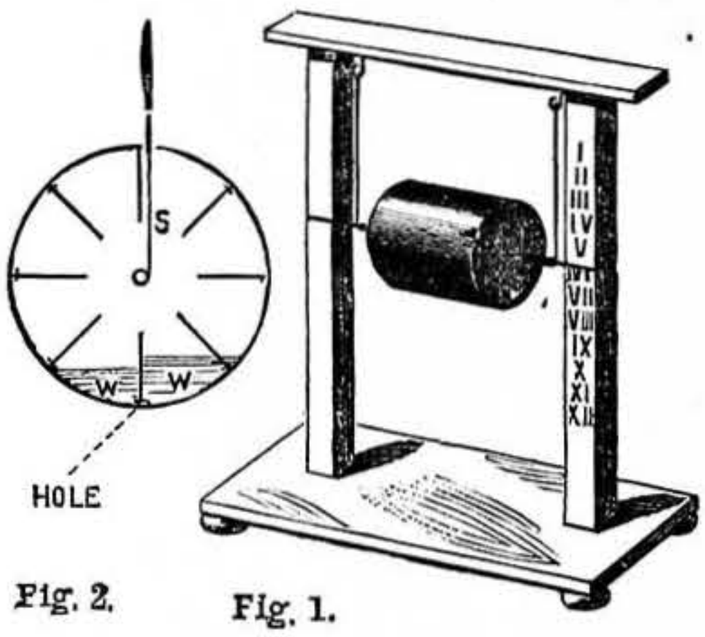


Fig. 2. Fig. 1.

Fig. 1.—Water Clock Diagram. Fig. 2.—Section of Cylinder, showing Divisions and small Holes in each; also the Water and String (W S).

doubt ingenious, and the arrangement of the water in the cylinder is curious and interesting; therefore, publicity is given to it in "Shop." As a clock, however, it can only be classed as a "fad." It might tell the time for a week or more, but the winding it up and collecting the water at the right spot, in order to start it at the right point, would be, we should think, a great difficulty. The holes might corrode or get blocked up, and then where would the time be? If a clock of an out-of-the-way kind be desired, a large sand glass would probably be a more correct time keeper. But why go so far into the wilderness when every market is deluged with Walthams and Waterburys?—ED.]

Castor-Pin.

Worn-out Castor-Pin.—A. X. E. (*Nottingham*) writes:—"To repair a chair or table leg having a broken or worn-out castor-pin, the following is a good way: Take a piece of birch, beech, or oak, about 4 in. long by 1½ in. by 1½ in., and turn it to fit the castor cup, with ½ in., ⅝ in., or ¾ in. dowel-pin, according to size of leg to be repaired; a ½ in. dowel-pin would be suitable for an ordinary easy chair leg. Cut off old castor-pin level with shoulder on bottom of leg; then bore a hole in the centre of leg with a dowel-bit, the same size as dowel-pin, taking care to bore quite true; now fit new pin and glue into leg, then refix castor, and the job is finished. If done carefully the leg will be as sound as when new."

II.—Questions Answered by Editor and Staff.

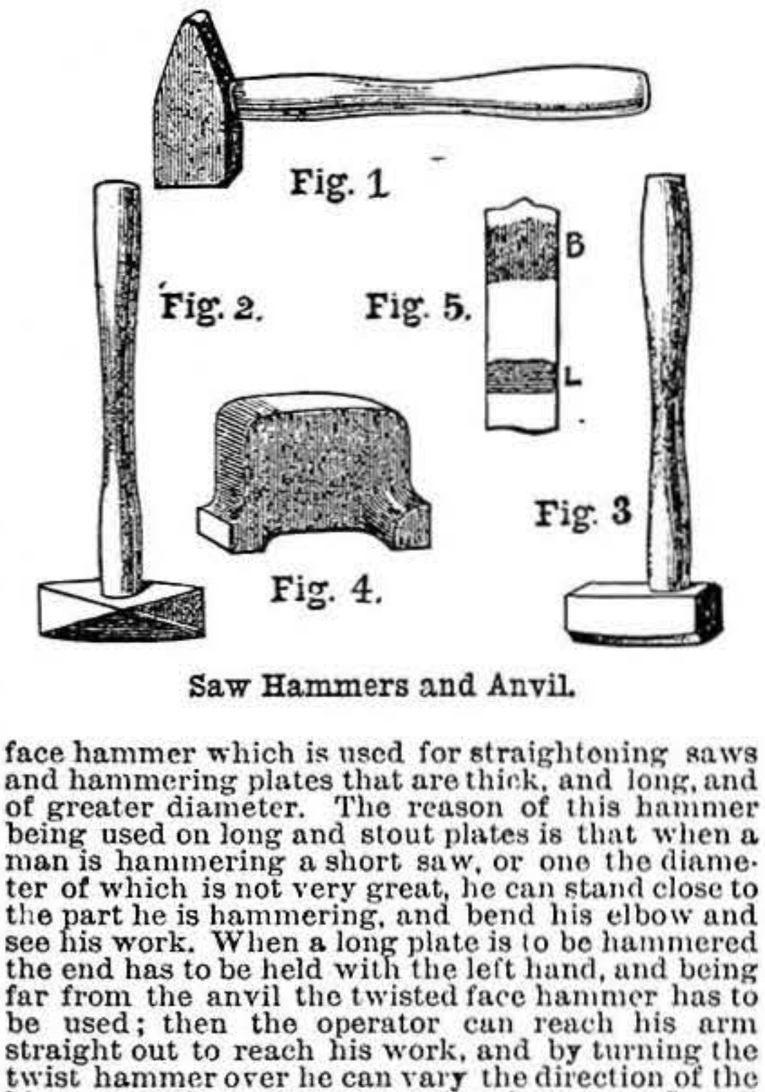
Driers.—E. S. (*Manchester*).—"Terebine" is the name given to a drying liquid, which, I believe, was so termed by the original maker, Powers, of Coventry. Every colour and varnish manufacturer, however, now makes a terebine or liquid drier, and its drying strength is usually that of 1 oz. to the lb. of paint, under favourable conditions. Terebine combines far more satisfactorily with linseed oil for drying than does japan gold size, a similar mixture. The latter is most useful in compounding "flatting" and quick-drying paints for varnishing upon. I am unaware of any reliable recipe for making this useful painters' commodity having previously been published; but, through the kindness of Messrs. Mathieson Bros. (Colour Manufacturers, Ardrossan, N.B.), I am able to contribute a simple but thoroughly reliable recipe, which I am further confident will prove very useful and valuable to many professional painters: Take 2 lbs. ground litharge, 2 lbs. red lead, 1 lb. sulphate of manganese, ½ lb. sugar of lead; put all these into a pot, and mix with them four or five gills of pale Japan gold size, until the lot can be easily stirred. Then add about ½ gal. of American turpentine. Now leave the whole to stand, with occasional stirring, for a few days (not less than three), and its materials will act without heat. After the expiration of the few days, the clear resultant liquid—terebine—may be taken off, and more "turps" put on the materials, for the *second* and *third time*, with equally satisfactory results. Half proportions of these component articles may be used with equally good results. Those subscribers, and professional painters especially, who desire to avail themselves of this recipe, cannot do better than write to Messrs. Mathieson for the dry articles named, from which firm all readers of WORK will receive courteous and prompt attention.—F. P.

Shellac Varnish.—W. L. C. (*New Cross*).—The subjoined recipe for making a reliable shellac or "spirit" varnish is one coming from a most reliable source, and which, should you determine to act upon it, ought to work out as well as it reads. Take 3½ lbs. orange shellac, ½ lb. gum benzoin, 1 gal. methylated spirits; put all these (or in same proportions for larger or smaller quantities) into a closed stoneware or earthenware vessel. Shake the mixture occasionally, or, if the varnish is required at somewhat short notice, the lac, etc., will dissolve more quickly by slightly heating. The fluid ought then to stand in an open vessel for a few days before being used, and requires, finally, straining through a piece of strong fine muslin or fine wire cloth. "For a cheap varnish for fretwork brackets" you might be satisfied with "Patent Knotting"—or knotting varnish—thinned down, if required, with naphtha or spirits. This gives a good and hard gloss, and dries almost immediately. The recipe above given gives a spirit varnish much favoured by cabinet-makers and fiddle-makers. The small proportion of gum gives a better surface, and also allows more time for working it.—F. P.

Ox-Gall in Marbling.—NO NAME.—Our querist on this matter should have stated more particulars, and what marbling process he means, whether on wall-paper, book edges, or painted walls. The subjoined may, however, aid him: *Ox-gall*, when mixed with water colours and pigments, acts as a binding vehicle, but is chiefly noted for the property which enables us, by its addition, to manipulate water mixtures upon polished or greasy working surfaces. *Borax* has the same property, however, and, for many purposes, is preferable to ox-gall. Oils and varnish may be mixed with water more readily by the aid of borax. I conclude you must refer to bookbinders' work.—F. P.

Velocity.—KNARF.—Air will flow into a vacuum at the rate of about 1,829 feet per second when the temperature is 60° Fahr. and the pressure 15 lbs. per square inch. I am not aware that this has been directly estimated, but it can be reckoned from the known absolute velocity of a molecule of hydrogen at 32° Fahr., and 29·92 in. Bar., which is 6,097 ft. per second. The velocities of the molecules of gases vary inversely as the square root of their specific gravities. Oxygen is sixteen times as heavy as hydrogen; hence the velocity of the oxygen molecule, for the same temperature and pressure, would be $\frac{1}{\sqrt{16}} = \frac{1}{4}$ that of the hydrogen molecule, or 1,524 ft. per second. Similarly the velocity of the nitrogen molecule, which is fourteen times as heavy as hydrogen, would be 1,836 ft. per second. Taking air as consisting of four parts of nitrogen to one of oxygen, the velocity of air molecules will be 1,774 feet per second at 32° Fahr. and 29·92 in. (= 760 mm.) Bar. You do not say what is the temperature and pressure of the air you are working with. If different to the above, you can reckon out the velocity from the general formula which applies to all gases—viz., $v^2 = 3\frac{p}{d}$ where p is the pressure and d the density of the gas; but the same fundamental units must be used for both p and d. At 60° Fahr. and 2,160 lbs. per square foot (= 15 lbs. per square inch) pressure, the density of hydrogen is 0·00528275 lbs. in a cubic foot. Hence $\frac{p}{d} = \frac{2160}{0{\cdot}00528275} = 408{,}878$ in gravitation units, and if the intensity of gravity be taken as 32·2, then $v^2 = 3\frac{p}{d} = 1{,}226{,}634 \times 32{\cdot}2 = 39{,}497{,}615$, and therefore $v = 6{,}284{\cdot}7$. At ordinary temperature (60° Fahr.) and pressure (15 lbs. per square inch) the velocity of the hydrogen molecules will be 6,284·7 feet per second. Using this figure in place of 6,097 as above, we find that the velocity with which air will flow into a vacuum is 1,829 ft. per second at 60° Fahr., and 15 lbs. per square inch pressure.—F. B. C.

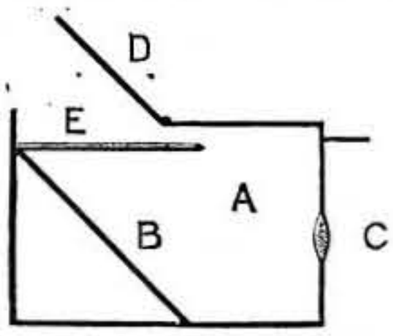
Saw Hammers.—A. C. R. (*Cardiff*).—It is a pleasure to me to give a description of tools required for saw hammering. I have given rough sketches of the three hammers and anvil used for the purpose. Fig. 1 represents the long cross-face hammer The face parallel with the handle is the long face, and the other the cross face. The faces are at right angles one to the other, so that the operator may strike blows that will be lengthways in one direction, as in Fig. 5 (L), and by turning the other face, as in Fig. 5, at B. Both faces of this hammer are rounded across the width and a little in the length. The amount of roundness regulates the hammer marks. The roundness of the faces of this hammer should not be so much as that in a hammer used for hammering saws after they have been ground, so that the marks may not be so plainly seen or be so deep in the plate. Fig. 2 represents a twisted



Saw Hammers and Anvil.

face hammer which is used for straightening saws and hammering plates that are thick, and long, and of greater diameter. The reason of this hammer being used on long and stout plates is that when a man is hammering a short saw, or one the diameter of which is not very great, he can stand close to the part he is hammering, and bend his elbow and see his work. When a long plate is to be hammered the end has to be held with the left hand, and being far from the anvil the twisted face hammer has to be used; then the operator can reach his arm straight out to reach his work, and by turning the twist hammer over he can vary the direction of the blow as with the long cross-face hammer. It will be understood that these hammers are used for straightening the plate. Fig. 3 represents a dog-head hammer, the face of which is rounded. This hammer is used to equalise the tension, as a blow struck with the dog-head will have equal effect Fig. 4 represents the anvil on which the saws are to be hammered, the face of which should be hard and slightly convex, so that the plate may have a solid bearing on the anvil. If the plate does not lay dead or solid on the anvil, the blow from the hammer will indent the plate, and the blows will not have their desired effect. I might say that, as a rule, the cross-faced and the dog-head hammers are the only hammers required outside of the smithy, or works where the saws are being made, and that the average weight of these hammers is about 3 lbs. The blows delivered should be regulated according to the thickness of the plate.—A R.

View Finder.—T. M. (*Liverpool*).—There are several kinds of view finders: those attached to the camera and forming part of it, and those entirely separate. The simplest kind is a double concave lens, mounted in a frame with an oblong opening of the same proportions as the plates to be used. This is either held in the hand or fixed on the top of the camera; the view will be seen in miniature in looking through it. Another is practically a small camera with the view reflected on the ground glass of the same proportion as the plate used, and may be carried as separate instruments or attached to the camera as in the usual hand cameras. The best is when two lenses of equal foci are used, as in the artist's camera, which is neither more nor less than a double camera, one for viewing the image, and the other for taking it. A useful finder may be made of a small box about 3 in. long, 2 in. wide, and 2 in. deep, with a simple double convex lens, of 2½ in. focus, arranged in the manner shown above.—D.



View Finder—A, Box; B, Mirror; C, Lens; D, Shade; E, Ground Glass.

Grinding Stone.—J. B. (*Castle Eden*).—You can procure a stone from John Dove & Co., St. Nicholas'

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Buildings, Newcastle-on-Tyne. You must give them the size and say what you want it for. As it will most likely be a small one, they may not have it in stock, but will be able to get one for you. Do you think a stone will be suitable for razors? I should think a buff wheel—that is, a wooden wheel covered with leather on the edge, and sprinkled with fine emery—would be more suitable.—M.

Slate Slab.—G. A. W. (*Holloway*).—Draw a line on the slab at both sides where you wish to cut it, then take a joiner's tenon saw, about 12 in. long, and saw to the line. You must be careful to start the saw square, and have the slab firmly fixed. As 6 ft. is rather a long cut, you may have to sharpen the saw before you get through; but you will find it cut very well. I have sawn several in this manner.—M.

Finishing Stove Grate.—DLOGIREM.—There is no method by which you can finish an ordinary mantel sham in the manner referred to, except by first grinding and glazing. You can, however, improve it in the following manner: Go carefully over the whole surface, and file level all projections: then take a piece of sandstone with a level face, and scour the whole surface, using circular strokes, till you get a fairly smooth surface, and finish with emery-powder and water, laid on with a level piece of wood; clean off and dry, and give a coat of paint. When the paint is quite dry, rub down with fine glass-paper stretched on a piece of board, and keep on painting and rubbing down till you get a satisfactory surface, when you can finish in any colour you wish. The paint should be of the best quality, and if you are not able to judge the quality of the ingredients yourself, you had best get a practical painter to mix it for you, telling him for what purpose you require it; as although you may know what ingredients to mix, if you cannot judge between good and inferior materials, your work may crack or blister. You will find a good deal of information on painting in Vol. I. of WORK, which, if you have not read, I should advise you to procure.—M.

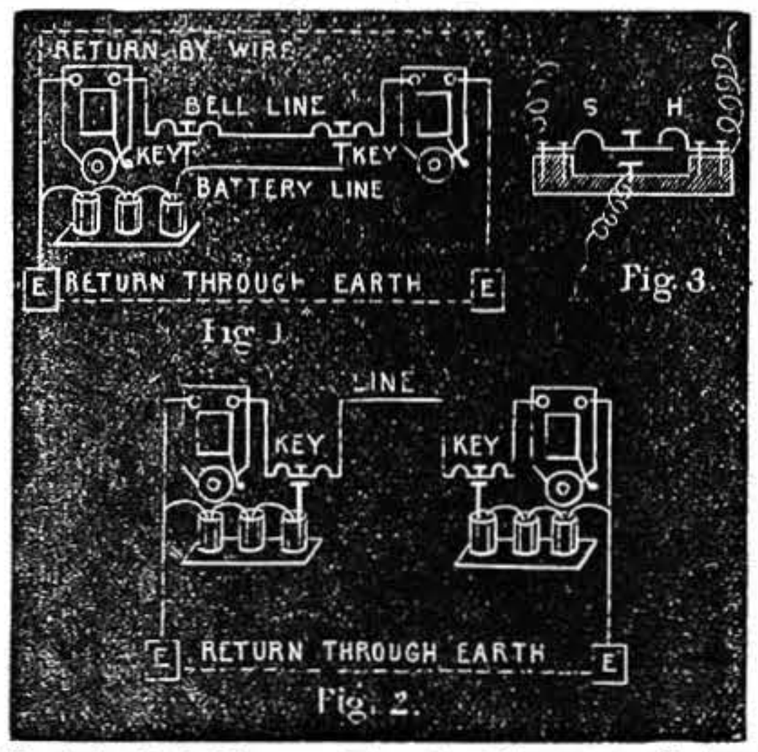
Model Electric Lights.—W. G. B. (*Wolverhampton*).—The series of articles on "Model Electric Lights" appeared in Nos. 76, 82, 89, 92, 94, 97, 99, 101, and 104—nine numbers; the whole set can be obtained post free from Messrs. Cassell & Co. for 1s. 1½d., or through your newsagent at the usual price of 1d. per number. In ordering from the office, always enclose an extra halfpenny stamp for each number, to cover postage; thus four numbers will cost 6d. This series of articles covers the whole ground of electric lighting likely to be taken up by amateurs. The first two treat of the principles governing electric lighting; the third gives instruction on lighting by battery power; the next four give detailed instructions for making four types of dynamos; the next deals with accumulators; and the last gives illustrations of the fittings required in an installation.—G. E. B.

Electric Light Battery.—G. J. S. H. (*Coventry*).—Always mix sulphuric acid with water by adding the acid *to* the water in a thin stream. If you do the contrary, and add water to the acid, the mixture will boil and spurt some of the hot fluid over the sides of the vessel. This will scald the skin if dropped on it, and will also destroy clothing. First make a solution of 3 ozs. of chromic acid in one pint of water, and add 3 fluid ozs. or a wineglassful of sulphuric acid *to* this mixture. If the connecting strips of copper are the thickness of two sheets of writing-paper, and half an inch in width, they will convey all the current you will get from four cells. The shape of the lamp is of very little consequence. A far more important factor, and the probable cause of failure, is the resistance of the carbon filament in the bulb. A lamp to be worked with four chromic acid cells must be an 8-volt lamp, as this represents the right resistance of the carbon filament. If a 6-volt lamp is used, it will probably burn up with a flash. If a lamp of 9 or 10 volts is used, it will not light at all, because the resistance of the carbon will be too great. If the filament is broken you cannot get a light from it.—G. E. B.

Electric Light Dynamo.—OSCAMAW (*Battersea*).—Get Nos. 92, 94, 97, and 99, back numbers of WORK, obtainable for 4d. from a newsagent, or for 6d. direct from the office. In these you will find full illustrated details of four different types of electric light dynamos. To get at the horse-power required to drive any of these, multiply the ampères by the volts, and divide 746 by the product. On p. 644, in No. 92, the No. 2 Siemens may be driven by a ¼-h.p. engine. In No. 97, p. 726, the No. 1 Gramme will serve your purpose. In No. 99, on p. 758, either the No. 2 Manchester or Simplex will come nearest to your requirements. If you take the Manchester type, kindly note that in the diagram 59, on p. 757, there is a slight error. The wire should be shown at the back of the core on the right, going from right to left instead of from left to right. As you are an engineer, you will understand how to make a dynamo by aid of these articles, which were written for amateurs.—G. E. B.

Design of Small Dynamo.—T. E. W. FIX.—I have not seen such a machine as that shown in your sketch, or cannot say what power you may expect from it, but should surmise that the results obtained from it as a dynamo would be equal to those got from it as a motor—that is, "very faint" indeed. Why waste time on such an unheard-of type when good castings of tried machines can be had at low prices? You will find full information on dynamo making in Nos. 92, 97, and 99 of WORK, and will find therein some designs of four useful types.—G. E. B.

Electric Bell Lines.—J. M. (*Derby*).—You cannot ring two bells at two opposite stations with one battery working through a single wire. There must be a return wire on the circuit of each bell. Two bells can be rung with current from one battery if two wires and an earth connection be made, or three wires are employed together with special automatic switches or keys, as shown in the annexed diagram; or the two bells may be rung over a single line and earth, if special keys and two batteries are employed as shown in the second diagram. A diagram of the key employed in these arrangements is shown at Fig. 3. It may be made out of a few scraps of spring brass or German



Electric Bell Lines. Fig. 1.—Diagram of two Electric Bells and one Battery, showing how to work the Bells through three Line Wires, or through two Line Wires and an Earth Return. Fig. 2.—Diagram of two Electric Bells and two Batteries, showing how to work the Bells through one Line Wire and one Earth Return. Fig. 3.—Sectional Diagram of Key employed in the above Electric Bell Systems.

silver, bent to the form shown on the diagram, and fastened by screws to a wood base. All points of contact should be guarded with platinum. When the key is at rest, the long spring, S, is in contact with the hook, H. When the key is depressed the spring, S, comes into contact with the T-shaped piece below it, and thus connects the battery with the bell we desire to ring. When the key is at rest the home bell can be rung from the distant station, and thus a system of call and answer can be established. This system is more fully explained by me in "Electric Bells, and all about them."—G. E. B.

Shield and Monogram.—F. C. (*Belfast*).—Here is the shield and monogram you desire for fret cutting. To make the design a little more complete, some ornament has been introduced suitable for

J. D. B. Monogram for Fret Cutting.

metal or wood-work. Are you now convinced that we don't "think less of correspondents who live in 'Ould Ireland' than of English and Scotch ones?"

Hour Globes.—G. H. (*Leith*).—I do not know of any maker, and have been trying to find an importer who makes a speciality of them, but cannot do so; and I can only advise you to try the tool shops: say Haswell & Sons, 49, Spencer Street, Clerkenwell; or Grimshaw & Co., Goswell Road, Clerkenwell. Either of these, I feel sure, will supply you if you will give them the size, etc., you require.—A. B. C.

Ploughs.—F. W. G. (*Glasgow*).—I am very sorry if I have given the wrong address of the maker of ploughs, but the man I named had his place of business there when I was an apprentice in Glasgow, and I have ordered ploughs from him not *very* many years ago. In Glasgow you should not have much difficulty in getting what you want; any cabinet-maker can make them. But if you write to George Royle & Sons, Paternoster Row, London, you will get as many ploughs as you care to buy.—G. C.

Band-Saw.—AGRICOLA.—You say that you intend to fit up a band-saw. Do you mean a band-sawing machine? You should have stated the kind of work you intend to do with it, and by what power you intend to drive it. If by hand, my advice to you is to abandon all thoughts of fitting up such a machine, unless it is to do particularly light work. But if you have other than hand power to drive it, the machine may be very useful to you, and I hope you will succeed in your undertaking. To secure the satisfactory working of a band-saw, the pulleys or wheels over which the saw runs should be light, with consistent strength. The top wheel should be, say, one-third lighter than the bottom wheel. This is to prevent the top wheel overrunning the bottom wheel, and to lessen the breakage of saws. The wheels should be covered with indiarubber, to form an elastic bed for the saw. The top wheel should be so arranged that it may be raised or lowered so as to take saws of different lengths. There should also be an arrangement for canting the top wheel, so that the saw may be made to run on any part of its circumference. The last-named arrangement is of great advantage. Sometimes a saw may be shorter on the back edge than on the tooth edge, or *vice versâ*, when the strain will be greatest on the shortest edge; consequently, the saw soon breaks. By canting the top wheel the strain may be equalised on the width of the saw, and to some extent prevent breakage. The frame of your machine should be sufficiently strong to prevent vibration. The diameter of saw wheels should not be less than 24 in. Saws worked on wheels less in diameter as a rule do not give satisfaction. At the back of the saw, just above the cut and below the table, there should be a revolving disc to receive the back thrust. Be sure not to let the discs get deeply cut or grooved, or you will get frequent breakage of saws. Just above the cut and below the table there should be wooden guides on either side of the saw, to guide it as it enters and leaves the wood which is being sawn. In reference to joining a band-saw, except by brazing, there is a method, but it is not to be relied upon. In one end of the saw make two tongues, and in the other end make two corresponding openings; introduce the tongues into the openings, then press the ends together laterally, so as to cause the snugs on the tongues to hook on the bevelled edges in the openings. When the ends are in this position it will require a good strain lengthways to separate them. If you wish to disconnect the ends of the saw, separate the hooked and bevelled edges by applying lateral pressure, and at the same time draw the ends apart in the opposite direction. The only reliable way of joining a band-saw is to braze it, which process I presume you are acquainted with; if not, write again, or on any other point you wish made clear to you, and I will endeavour to help you. I might say that if you have not got Vol. I. of WORK, you can get it ready bound for 7s. 6d., wherein you will get some valuable information on saw repairing.—A. R.

Gold Blocking.—N. (*Finsbury Park*).—To remove gold blocking from leather may be done by washing carefully with paste water. If the leather is morocco or other grained leather, a clothes-brush may be used. Wash and brush over the gilded parts. Some parts will be more difficult to remove than others, but a little care will accomplish it. You will have to varnish the leather over with shellac varnish, which will make it look fresh again.—G. C.

Phonograph.—W. R. P. (*Hampstead*).—I cannot make out much from the sketch of your mouthpiece for above, so cannot tell you whether you have made it right. The cylinder of blotting-paper and candle-grease may be all right as an original dodge, but I do not wonder if you cannot get good results. Look up back numbers, and try something which has been already tried by others.—W. D.

What Emery Wheels are Made of.—T. P. (*St. Leonards*).—Made of an infinite variety of compounds, such as gum arabic, shellac, glue, bitumen, etc., to bind the particles together. Other kinds depend upon vitrification at high temperatures for binding the grains of emery. Vulcanite and tanite are also used, and these wheels are perhaps the safest from the danger of bursting. Every manufacturer has his own particular methods, which are not intended to be known. A simple emery grinder for an unusual shape, such as the inside of paring gouges, can be easily made by turning up a piece of wood to the correct sweep or sweeps to fit the inside of the gouges; then glue it quickly all over, and roll it in emery-powder. With

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this the gouges can be ground in the lathe by dipping them constantly in water, to prevent overheating.—F. A. M.

WORK Volume.—B. H. H. (*New Cross*).—Each year's weekly numbers of WORK are sold, bound in a cloth volume, price 7s. 6d. These and No. 4 of the "Popular Educator" are obtainable of Messrs. Cassell & Co., Limited, London, E.C., or of any bookseller.

Rubber Stamps.—COOKE.—Full instructions for making rubber stamps are given in Vol. I. of WORK, Nos. 38 and 40, pp. 594 and 630.—QUI VIVE.

Stringing the Zither.—H. R. (*Blackpool*).—Addresses of writers cannot be disclosed. Any stamped and sealed letter shall be forwarded.—ED.

Rubber Foot.—E. B. (*Dartmouth*).—I have too much sympathy with you in your affliction to willingly throw cold water on your proposals in this connection, but I am obliged to say that some of your suggestions are impracticable. (1) The sample of rubber sent is a good sample of vulcanised sheet rubber, but cannot be worked up again by you with advantage. (2) Solutions of rubber contain too little rubber to be of any use for your purpose. (3) Carving from a solid block offers a better chance of success, the only tool required being a sharp knife with a somewhat rough edge, moistened frequently with cold water. (4) Home-made vulcanisers would not suit the work, and a suitable one would be too expensive for use to recommend you to purchase one. "Rubber sponge" can be purchased at about 12s. per lb., and is very light; but I do not think it would be found elastic enough for you. May I suggest an alternative? If so, I would say, try cork instead of rubber. It is light, elastic enough for your purpose, and very easy to work—a knife, a half round bastard-cut file, and a sheet of glass-paper, being all that are required; it is also cheap. If thought desirable, a pad composed of, say, ten thicknesses of the sheet rubber of which you send a sample, might be placed between the wood and cork composing the foot. This would be even better if formed into a wedge, of which the thick end would be placed at the heel and the thin end at the toe end of the wooden part of the foot. On the whole, however, I would advise you to dispense entirely with indiarubber, and use cork as freely as possible.—QUI VIVE.

Printers' Ink.—A READER OF "WORK."—Printers' ink is not adapted for use with rubber stamps, which it would quickly spoil.—QUI VIVE.

Induction Coils.—T. E. W. FIX.—Dyer's book on "Intensity Coils" gives a few experiments to be performed with an induction coil and vacuum tubes; but I do not know of any book exclusively devoted to the subject.—G. E. B.

Induction Coil.—W. G. (*Long Lane, E.C.*).—The core should be made of iron wires annealed soft, and dipped in hot melted paraffin wax, to insulate the wires from each other. If for a small spark coil, this core may be enveloped in two or three folds of paraffined paper, and the primary wire wound on this direct. If for a medical coil with sliding regulating tube, the core must be fixed in the body of a bobbin, the tube made to slide over the core, and the primary wound on over the body of the bobbin. In the former case the paraffined paper insulates the wire from the core; in the latter case the body of the bobbin is the insulator. The wire must be insulated from the core. The quantity of silk-covered wire to be used in the primary must depend upon the size of the coil and its intended use. Just tell me the length of spark you wish to get from your coil, and I shall have pleasure in giving you dimensions, length, and size of wire, and other particulars. A wire goes from one terminal to the foot of break spring, and one end of the primary is connected to the break pillar. The ends of the secondary wire go to the handles. For further particulars, see my articles on "Induction Coils" when they appear in WORK. The battery of Leclanché cells will work a coil giving an inch spark or more.—G. E. B.

Castings of Dynamo.—R. T. (*Paisley*).—Castings for the small Siemens dynamo, shown on p. 644, Vol. II., of WORK, can always be obtained from Mr. S. Bottone. The castings may not be as exactly as shown at Fig. 16 on that page, but will serve the same purpose. I think Mr. Bottone has introduced improvements favourable to the amateur since the sketches for those drawings were made. The castings sold by Mr. G. Bowron, Praed Street, London, for the same class of dynamo, differ in form from any of those shown on the page above mentioned, but may still be regarded as Siemens' dynamo castings. If you write to either of those gentlemen, they will send price lists.—G. E. B.

Astronomical Telescope.—A. G. (*Newcastle-on-Tyne*).—There seems, as you say, a mystery about telescope making; but it is only because the average man is quite ignorant of the art. The mystery begins to disappear as you get an acquaintance with the subject. The telescope you speak of as costing £5 would not show you planetary and lunar detail as they are shown in the average popular astronomy. Those engravings are carefully and exquisitely drawn by observers who have the use of the most powerful instruments. I tell you this because too often a would-be astronomer, fired with a desire to see for himself wonderful lunar and planetary pictures, full of the exquisitely delicate detail such as he sees depicted in the pages of text-books, pays £5 down for a popular telescope, and then is so grievously disappointed at the result of his star-gazing, that he gives up astronomy altogether. Yet a great deal that is wonderful and beautiful can be seen with a small glass, when you learn how to use its power to proper advantage; and even if this were not so, I shall show you that there is no reason why you should not finally possess a very powerful instrument. You have discovered the great obstacle to the possession of an astronomical telescope when you say that it is difficult for a workman to obtain one "without going to a very great expense." Now, there are two reasons why a good astronomical telescope is so very expensive. One reason is that the chief item in the production of a large telescope is the cost of the skilled labour required to prepare the lenses; and from this the other reason follows naturally, because, the instruments being so dear, there is a comparatively small demand for them. Telescopes are of two kinds—*refracting* and *reflecting*. The reflecting telescope is seldom seen outside the astronomical observatory. It is comparatively easy to make, and, with one or two exceptions, all the great reflecting telescope makers have begun as amateurs. But this is not the case with the refracting telescope, where four or more surfaces have to be ground and polished instead of one, and where many severe obstacles to perfection have to be overcome. It is well within your power to make a reflecting telescope, *grinding and polishing your own lenses for it;* but if you want to make a refracting telescope, you will have to buy the lenses ready made. The outside cost of the rough glass for the chief mirror of a 9 in. *reflector*—that is, a reflector with a mirror 9 in. in diameter—would be about 5s.; the market price of the finished mirror—*without any*

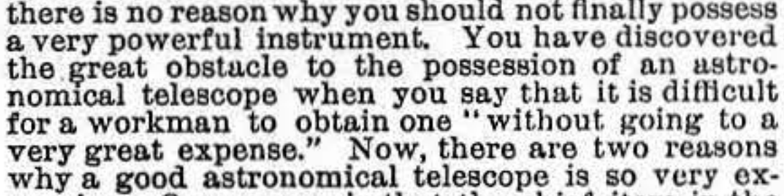

Fig. 1.

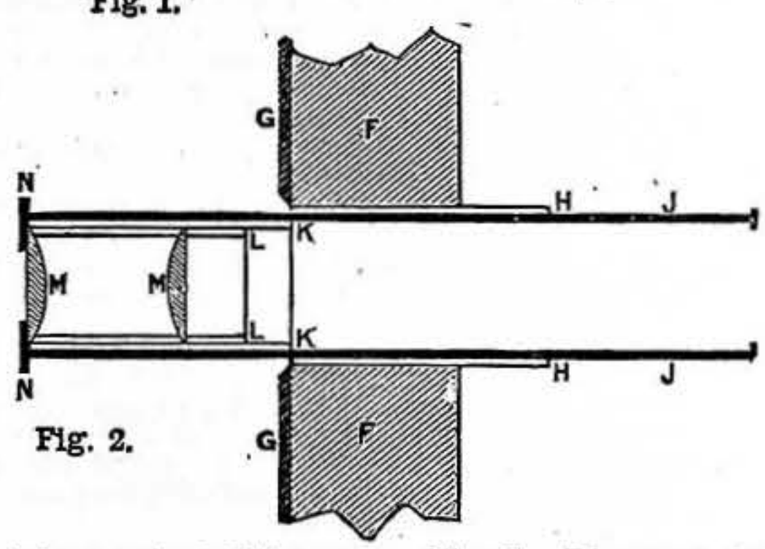

Fig. 2.

Astronomical Telescope. Fig. 1.—Diagram for Refractor. Fig. 2.—Diagram of Eye-Piece.

mounting—is, at a first-class optician's, about fifteen guineas. The difference in the price is the payment for skilled hand labour, no tools, properly so called, being necessary for its manufacture. But the cost of the rough glass for a lens of similar diameter for a *refractor* is about £25, and the market price of the finished lens, without any mounting but its brass cell, is £200. Here, also, the difference is in skilled hand labour. But you may see how much easier it is to make a reflecting telescope than it is to make a refractor. If you decide to make the reflector, you must watch the replies I am giving elsewhere in "Shop." You will get guidance there, and you must come to the Editor when you get into any difficulty. But if you decide to make a small refractor to go on with, above is a diagram to work from. I assume that you will purchase a 2½ in. achromatic object lens of, say, 36 in. focus. The price of this will vary from 30s. or less to £3, according to its quality. Then: A A A A is a piece of stout drawn brass tubing; B B and C C are rings cut from a smaller size tube, and fitting accurately inside A A, and turned or filed quite true at the edges. If they be true, and are stood on edge on a flat surface, the sides will be at right angles with that surface. The smaller ring, C C, should be slipped in, and fastened with the small screws, D, D. This forms a ledge for the support of the lens, E, which is then placed in position, and secured by sliding and screwing into position the ring, B B. At the other end of A is F F, a disc of wood turned to fit inside A, and pierced with a central hole, which receives a piece of smaller tubing, H H, which carries the eye-piece, as in Fig. 2. F F may be faced with a disc of brass, G, for appearance sake, if it be intended to polish the finished instrument. Required: Two plano-convex lenses, ⅝ in. in diameter and 1 in. in focus. Cost, about 1s. each; tubing, K K, into which the lenses will exactly fit. Fix them as shown by means of the smaller size tubing, L L. The lenses will require to be two-thirds of their focal (not joint focal) length apart, in this case two-thirds of an inch. The focal lens is kept in place by a pierced brass disc, N, soldered or screwed to K. It will be observed that the finished eye-piece, K N, slides into the longer tube, J, which in turn slides to and fro in tube H, fixed to F. By this means the eye-piece can be pushed towards or pulled from the object-glass to get the proper definition. This eye-piece is called the Ramsden eye-piece. The completed telescope will require to be mounted on a firm ordinary telescope stand, which I have not space left to describe here. It will be seen that I have chosen the simplest possible form of mounting—a form which entirely obviates the necessity for screw cutting. There are other methods and other eye-pieces, but this form contains all the essentials. The magnifying power could be increased by using an eye-piece made on the same principle, but with lenses of shorter focus. Finally, the cost of the whole instrument could be lessoned by the use of an ordinary uncorrected single lens for the object-glass. Such a lens would cost about 2s. 6d. or 3s. 6d., but, of course, the object under examination would not appear clearly defined or free from colour.—E. A. F.

Vulcanite Tubing.—C. C. (*Clapham Road*).—This can be obtained of most of the manufacturers of rubber goods, of which there are several in London, and can be united by means of a thick solution of rubber in mineral naphtha or bisulphide of carbon, or by a solution of shellac in methylated spirit. Vulcanite can also be moulded when softened just sufficiently by gentle heat to enable it to take the requisite shape under considerable pressure.—QUI VIVE.

Staining Xylonite.—W. J. H. (*Reading*).—An address where xylonite can be bought was given in "Shop," p. 556 (No. 139). Xylonite, celluloid, parkesine, or ivorine, are practically the same, and mostly made in France and America. I am using some now which bears the impress, Celluloid Manufacturing Company, U.S.A., which, being white and used mostly for musical instruments, is obtained from wholesale dealers in musical fittings. Much information and useful hints on xylonite will be found in WORK, No. 101, p. 787, "Xylonite: its Nature and Use;" and in No. 113, p. 130, "Xylonite as a Material for Fret Sawyers." I have found the aniline dyes as sold by chemists and drysalters in packets and tubes a good staining medium. The chemical stains as used for ivory are in most cases impracticable in use, and should in all cases be used with caution, as owing to the acids and camphor used in the manufacture of xylonite, an opposite effect to that required might be given. As the material can be bought ready dyed in self and fancy colours, also in imitation of pearl, marble, and tortoiseshell, etc., you will see there is little need to use the stains oneself, unless you, as a stick-maker, require to finish your stick handles, engraved, or incised and coloured, as sometimes seen. In that case, the pattern is mostly incised and the inner portion stained; the incisions are then useful, as they prevent the stains from running. Pigments or oil colours will not do, as in the process of polishing by means of pumice powder, or tripoli and benzoline, they would be rubbed off again. After the polishing the incisions are generally finished gilt, which gives a pretty finish.—LIFEBOAT.

Puzzle Purses.—A POLE.—It would not be worth your while to follow this up. The possible profits to be derived from your idea are of a most slender kind.

Canoe.—B. B. (*No Address*).—If you have only a few joiners' tools it is hardly likely that you will succeed in building a canoe for that "large pond" near your house. You had better be less ambitious, and in your desire to be mechanical, make some experiments first with a small boat or other model.—ED.

Ship Models.—R. J. B. (*Whitby*).—It would occupy too much valuable space to give illustrations of the vessels you ask for as models; but any definite question you may ask shall be answered.

Voltaic Battery.—F. M. (*Thornton*).—In the first place, it would be better to test your cell currents by an *ammeter:* the ammonium sulphate test is rather delicate, and applied to a cell of so low a voltage as the Leclanche, may mislead anyone not accustomed to its use. In your "Fuller's Patent" cell you seem to have omitted the mercury, which should be placed in the bottom of the cell. You should remember that the zinc element is that which is used up—burnt, as it were—and also that the best of commercial cast zinc is impure, and therefore *local currents* are set up when the circuit is broken. To prevent this, amalgamation is resorted to, and the mercury in the "Fuller" cell preserves the zinc from local currents, because it keeps the zinc amalgamated. You seem to take a great interest in this matter. I should advise you to study the polarisation of low-power cells, with zinc and copper couples, with a view to arrange a *perfectly constant* battery. If you write again, I shall be glad to give any advice I can.—F. C.

Ventilating Tunnels.—D. D. (*Edinburgh*).—Your proposal is quite practicable, but unfortunately it is not new. It was proposed a good many years since. There are several practical difficulties in the way of its adoption, and unless a very large tube were used, it would only be suitable on lines worked by engines which exhaust into the tender or into a condenser. Your experiment does not include the effect of the powerful exhaust blast from a locomotive chimney.—F. C.

Iron-work Book.—J. S. W. (*West Bromwich*).—Working drawings are rather difficult matters to treat in a book. A good many are given in Humber's "Treatise on Iron Bridges," but that is a very costly work. There is a very simply written book showing how to calculate and design the details of iron bridges from which to make working drawings. Its title is "Materials and Construction," by F. Campin, published by Messrs. Lockwood & Co., London.—F. C.

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Delta Metal.—IGNORANT.—I cannot answer your question, for the simple reason that Delta metal is a patented invention, and beyond the fact that certain materials are used in its composition, the general public know nothing of Mr. Dick's methods, which are the result of many years' experiments. The methods and proportions can be so greatly varied that Delta metal of any required grade, both cast and forged, is obtainable. You could not make it, even if you possessed the secret of its preparation, because it is patented. If you write to the Delta Metal Company, Limited, 110, Cannon Street, E.C., and ask for their pamphlet on "Delta Metal," you will obtain from it nearly all the information available on this useful alloy.—J.

Polishing and Upholstering Chairs.—A. T. (*Canonbury, N.*).—Much has been given in the present volume on the subject of French polishing. Consult "Shop" and the indexes. You omit to tell us how you were going to buy the frames, whether in the *white*—*i.e.*, unstained or unpolished—or in the natural woods—*i.e.*, walnut or mahogany. Presuming that you buy them in the natural woods, ample instructions have been already given; on the other hand, if in the white, it will be necessary to first stain them, walnut or mahogany being the usual finish. In that case, I cannot do better than refer you to a reply given in "Shop" ("Staining and Polishing Cheap Furniture"), p. 476, No. 134. For a walnut stain, refer to "Means, Modes, and Methods," p. 439, No. 132. As regards the upholstering, you have set yourself a difficult task in desiring to take your first lesson on saddle-bag upholstery. Without in any way desiring to dishearten you, I should have thought it best to practise first at plain work. To give only a fair idea of how it is done, the materials required, and tools to use, would take up at least a whole page of WORK. You would do well to procure the second volume of WORK, or at least Nos. 78 and 100, in which will be found articles on "An Armchair: How to Make the Frame and Upholster it." I need hardly remind you that all necessary staining and polishing are done previous to upholstering.—LIFEBOAT.

Painting and Graining.—W. W. (*Nelson*).—A useful little manual for amateurs can be obtained from Brodie & Middleton, Long Acre, London, price 2s. Vol. I. of WORK contains much useful information on the first-named branch, and the present volume will eventually contain the required knowledge for studying graining. If you haven't Vol. I., *get it quickly*, its value will increase with each issue. As a practical worker, acquainted with all classes of technical literature, I look upon it as a wonderful collection of information and instruction, worth its cost a dozen times over.—F. P.

Potash Solution.—P. P. (*London*).—To make a saturated solution of any salt, the salt, as chlorate of potash, is added to and stirred up with water, until the water will dissolve no more. Hot water will dissolve more of most salts than cold; thus, boiling water will dissolve ten times as much chlorate of potash as cold will, and a convenient way to make a saturated solution is to dissolve as much of the salt as you can in boiling water. On cooling, the excess of salt will crystallise out, leaving a cold saturated solution.—F. B. C.

Varnishes.—KING BRUCE.—You do justice to your *nom de plume*, and we hope will now attain the desired success. I must confess your requirements of a varnish "which must not soften on exposure to dampness nor blister with heat," appear to the writer as two points which could scarcely be guaranteed by the most experienced of varnish makers. According to my promise in a previous answer, I have, however, consulted an authority more experienced in making varnishes than the undersigned, and append herewith the advice and recipe. With the fullest confidence in the source from which it is obtained, I commend it to you: Stained Varnish: 2 lbs. gum benzoin, 2 lbs. orange shellac, 1 gallon methylated spirits; put all in a stone vessel, and shake them occasionally until dissolved; then stand in an open vessel for a few days before using, and also strain through a fine strainer. The desired colours can be obtained by adding aniline colours to the desired shade. This varnish should be used in a warm atmosphere. For making the "white" varnish, use white shellac instead of the orange. The gum above specified is the real basis of the varnish; the shellac may be varied from 50 to 100 per cent.; but this I would not advise you to experiment with until you have succeeded with the proportions given and the colours you require for the various kinds of pipes. For the gums, etc., write to Mathieson Bros., Ardrossan, N.B., and watch the advertisement columns of WORK.—F. P.

Wire Bird-Cages. — RUFUS.—An article has already appeared on making wire bird-cages. (See Nos. 54 and 80 of WORK.)

Wire-Work (Bending Tube for Surrounding).—R. J. (*Burdett Road, E.*).—If you want to bend only one or two tubes for surrounding wire-work, the following method will answer: Select a tube composed of as thin metal as compatible with the desired strength, and secure it to the bench by means of small screwed blocks on each side, touching, but in no other way being connected to it. Pass a stick, as tight-fitting as possible, along the interior of the tube. Lever the tube by hammering a chisel through its upper surface, taking care that each cut is in a direct line with the previous one. When cut its whole length, withdraw the stick. Secure a hard wood or metal block to the bench, the outline of it corresponding to the desired curve to be given to the tube. If the latter is not too strong, you can bend it round the block by the assistance of your hands only; but it may chance that it will need to be hammered, which should be done with some soft material intervening, to prevent bruises. Begin bending at the middle; or if the tube is too strong for this, staple one end against the block, further securing it with an end nail, and then progress with it. Use nippers to squeeze the tube, thus split and bent, over the wire-work.—J. S.

Cabinet Design.—SCHEMER.—Thanks; but your designs are hardly up to WORK standard.

III.—QUESTIONS SUBMITTED TO READERS.

**** The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

False Hand.—INDIARUBBER writes:—"I venture to ask if any reader of WORK could give the address of an indiarubber firm where I could get a false hand made, as I have had the misfortune to lose part of my hand and three fingers. If I made a model in plaster, could I get it cast in indiarubber with hollow fingers, to be as light as possible, but at the same time stiff—much the same as indiarubber dolls are made?"

Asbestos.—YENWILL writes:—"Will any reader of WORK kindly say if asbestos can be woven into a cloth or kind of tape without any foreign substance being mixed with it? I have a specimen of asbestos-woven cloth, but it appears to have a mixture of some sort, and I wish to get some without if I can. Also what is about the price of raw material?"

Double Flageolet.—S. (*Bristol*) writes:—"Can any of your readers inform me where I can procure a double flageolet, and what would be the price, or give me information as to the making of one?"

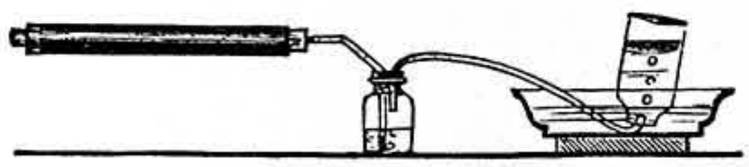
Whip Handles.—E. E. S. (*Bickington*) writes:—"Where could I get leather handles for driving whips? I have asked in shops about here, but they can't tell me. I know they are to be had, and I should say probably at Birmingham."

Paper-Making.—J. W. (*Plumstead*) writes:—"I shall be glad if any reader could give me information as to addresses of paper-mills, or aid me to find out prices paid for rags, bones, etc."

Breeding Cage.—GAMMA writes:—"I am about to make a breeding cage, introducing some fret-work and painted glass; the size I proposed making it to be 20 in. by 17 in. by 10 in. My idea was to make three of the sides of ¼ in. wood, with fret-cut windows, having tracery something in the cathedral window style; the windows to be afterwards glazed and painted like stained glass. Could any of your correspondents suggest a design for the cage—something in the Gothic style?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Still for Wood.—H. B. S. (*Liverpool*) writes, in reply to LONDON (see p. 542, No. 138):—"If you want to distil the wood on an experimental scale, get a piece of iron pipe about a foot long and about an inch wide, with a screw plug to fit one end; to the other end fit a cork with hole bored, and bent glass



Still Parts.

tube. For collecting the tar and water, use a small bottle with tubes and cork; and for collecting the gas, a pickle jar filled with water and inverted in a tin or other bowl partly filled with water: heat the iron tube in a fire or over a burner up to about 2 in. from the cork. On the large scale wood is distilled in retorts similar to those used in the manufacture of coal gas, made of cast iron, and heated in a furnace suitably constructed."

Cardboard Models.—A. H. (*Woolwich*) writes, in reply to C. W. S. (*Northallerton*) (see p. 574, No. 140):—"You would be able to obtain them from Clarke & Sons, Hatton Garden, London, or by ordering them from any large newsagent in your town."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—CELL; J. B. (*Dalton-in-Furness*); B. J. (*King's Lynn*); B. R. (*Sandbach*); W. H. (*Brinscall*); LUDO VICUS; G. (*Sydenham*); T. W. (*Kendal*); R. W. (*Bold Heath*); W. B. (*North Woolwich*); BEGINNER; P. L. (*Selly Oak*); J. A. B. (*Camberwell*); W. S. (*Stourbridge*); R. C. (*Battersea*); E. H. J. (*Bishopston*); F. H. (*Battersea*); A. M. B. (*Dublin*); OLD BOAT; E. A. (*Sheffield*); F. H. (*Finchley*); R. S. (*London, E.C.*); F. S. (*Leek*); S. A. (*York*); N. M. (*Sheffield*); G. C. (*Stratford-on-Avon*); M. F. (*Oldham*); P. H. (*Bristol*); HOT WATER; M. W. (*Manchester*); P. D. (*Lincoln*); S. R. (*Newry*); T. W. B. (*Faversham*); W. H. E. (*Crewe*); H. M. (*Manchester*); EDDIFRA; C. W. L. (*Newcastle-on-Tyne*); W. W. (*Staleybridge*); W. H. (*Egham*); GAS LIGHTER; RALPHO; J. W. & Co. (*London, W.C.*); LEISURE TIME WORKER; W. T. L. (*Battersea*); PUZZLED; REV. E. C. I. (*Kyneaton, Australia*); W. H. (*Failsworth*); W. C. (*Wandsworth*); P. H. (*Allandale Town*); J. H. (*Bury*); ANXIOUS; F. C. (*Slaithwaite*); R. F. (*Eastbourne*); D. C. (*Marsden*); B. J. (*Bingley*); W. A. (*New Radford*); A. H. (*Bridgeton*); F. G. M. (*Dublin*); A. W. (*Parsonstown*); J. W. B. (*Huddersfield*); W. B. (*Ramsey*); J. D. R. (*Leven*); F. W. M. (*Childs Hill*); P. & W. (*Kingsland*); ANGLO DANE; E. McH. (*Hebburn-on-Tyne*); H. B. (*London, W.*); F. W. W. (*Bradford*); VERY ANXIOUS; W. H. C. (*Leeds*); E. G.; W. B. R. (*Westbury*); A READER; TRIPLE EXPANSION.

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Water Motors from 5s.; ½ h.-p., 20s.; list, stamp.—WALTON, 9, Queen Anne St., Stoke-on-Trent. [5 S

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